# SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXVI.—No. 10.
[NEW SERIES.]

NEW YORK, MARCH 2, 1872.

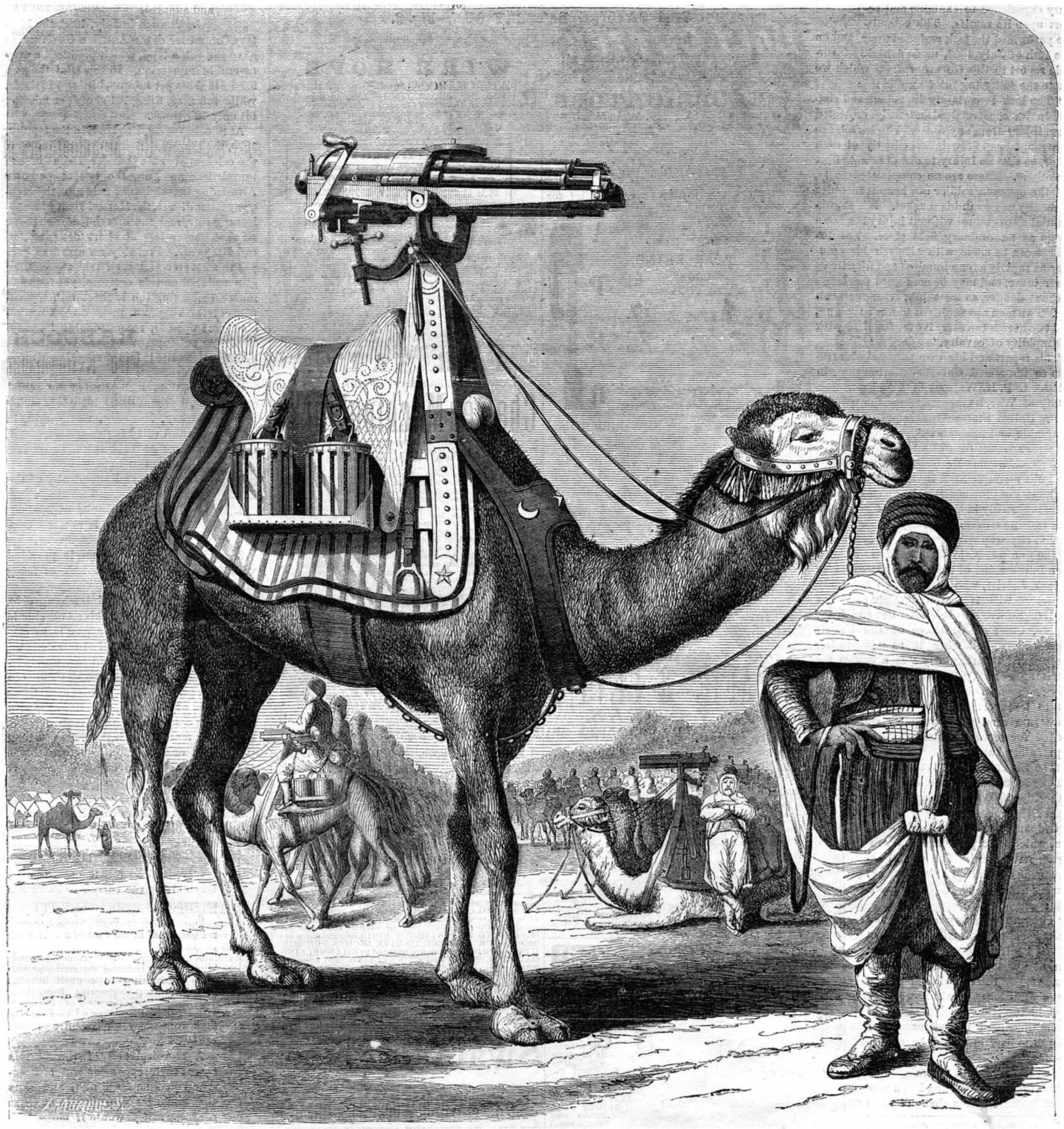
$3 per Annum.
[IN ADVANCE.]


## THE GATLING SYSTEM OF FIREARMS.

Probably the most destructive field weapons, ever yet devised by man, are those illustrated in the accompanying engravings. In saying this, we are perfectly aware that we make a very strong statement. No class of invention has absorbed more thought and study than that of military engineering. "How to kill" most effectively has been a problem, to the solution of which the finest mechanical genius, aided by all the discoveries of science, has been applied for ages. It is indeed sad to reflect upon the apparent necessity for improvements in the means by which wholesale slaughter is to be perpetrated; but one consolation may be drawn from the consideration that the more destructive weapons can be made the less is the probability that nations will seek to settle their controversies by the stern arbitrament of blood, and the sooner will come the happy era when a better and wiser method for the adjustment of differences will be adopted.

A peculiar merit of Mr. Gatling's invention is the facility with which it may be adapted to the exigencies of field warfare in various parts of the world. The engravings illustrate several such applications, the largest exhibiting the way in which it may be used on the backs of camels, in India or other oriental regions where the absence of good roads and the peculiar features of the country render these animals most serviceable both for attack and defence.

We think it safe to say that one of these guns, mounted upon the back of a camel, as shown in our engraving, or carried by an elephant would be, in some situations, an efficient substitute for a regiment of men armed and equipped in the best modern style of infantry practice. Figs. 2, 3, and 4 represent respectively the battery gun mounted on a horse with ammunition, etc., the gun as it appears mounted on a tripod ready for service, and, lastly, the gun with its tripod folded and carried on the shoulders of two men, whileothers carry the supply of ammunition.



THE GATLING BATTERY GUN.—Fig. 1.

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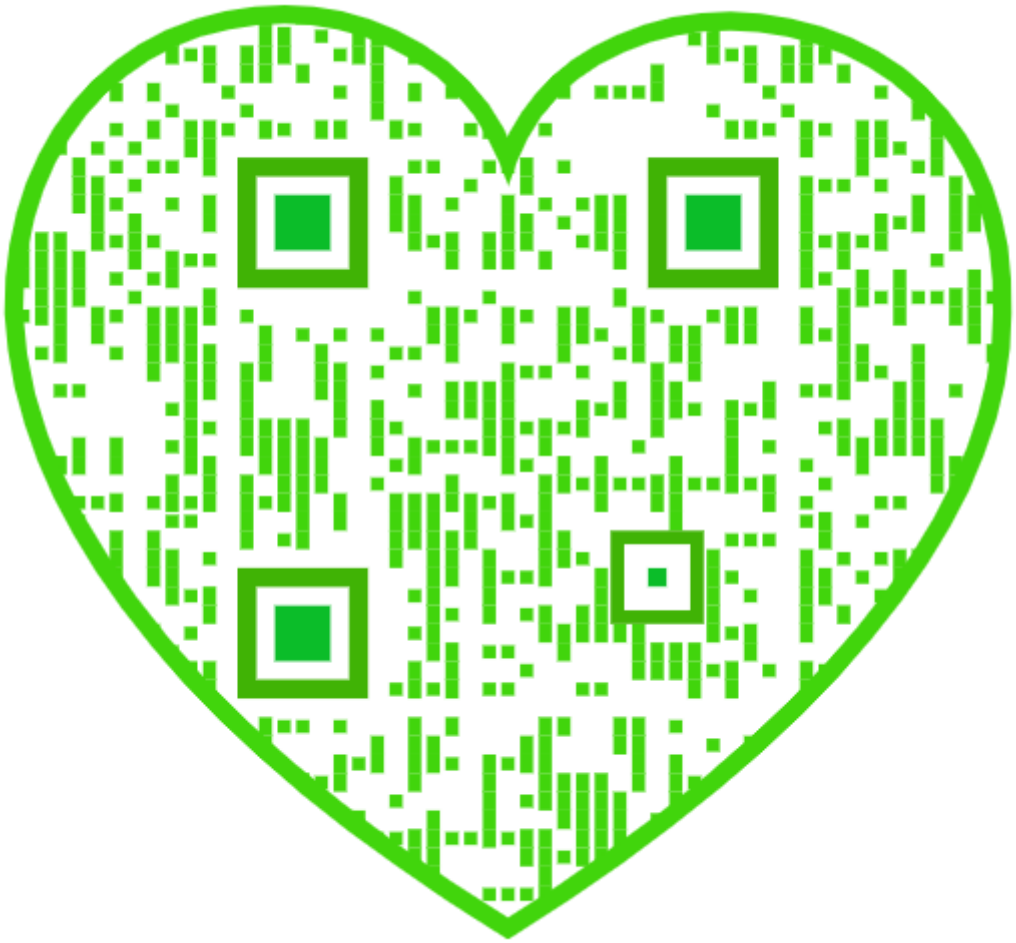


For a description of this gun, we avail ourselves of an excellent and exhaustive essay upon the subject, which we find in the "Science Record," for 1872*, from which we shall make such extracts as suit our present purposes.

HISTORY OF THE GUN.

The inventor of this wonderful arm is Dr. Richard J. Gatling, at the time of its discovery a resident of the city of Indianapolis, in the State of Indiana, but now of Hartford, Conn. He first conceived the idea of a machine gun in 1861, and is justly entitled to the proud distinction of being the originator of the first successful weapon of the kind ever invented. His first "battery" or gun was completed in that city in the early part of the year 1862, and his first American patent bears date November 4th of the same year. The gun was fired repeatedly during that year in Indianapolis, in the presence of hundreds and thousands of persons, over two hundred times a minute, and its performance was regarded by military men as so satisfactory that the Governor of that State, Hon. N. P. Morton—now United States Senator—appointed a committee of gentlemen of high standing and military experience to examine and report upon its merits. The committee performed the task assigned them, and on the 14th of July, 1862, made a highly favorable report to the Governor, from which we quote the following brief extract:

"The lock is certainly ingenious and simple in its construction, and fully protected from injury from any cause. The barrels are so arranged as to fire independently of each other, so that an injury to one does not affect the others. There are no complicated parts, and the common soldier can keep it in order as readily as he can his musket. It is so substantial as to endure without injury the same usage as an ordinary field piece. The discharge can be made with all desirable accuracy as rapidly as one hundred and fifty times per minute, and may be continued for hours without danger, as we think, from overheating. Two men are sufficient to work the gun, and two horses can carry it over the field with the rapidity of cavalry."

This report and his own personal observation so impressed Governor Morton that, in a letter to P. H. Watson, Esq., Assistant Secretary of War, he recommended the weapon to the United States War Department as a "valuable and useful arm."

MANUFACTURE OF GUNS IN CINCINNATI.

In the meantime Dr. Gatling had twelve of his guns manufactured in an establishment in the city of Cincinnati, Ohio, and fired them there repeatedly in the presence of army officers and the citizens generally. Among those in that city who witnessed the performances of the gun was Major-General H. G. Wright, then in command of the United States forces in that district, who also was so favorably impressed with it that, under date of March 11, 1863, he wrote to Brigadier-General J. W. Ripley, Chief of Ordnance of the United States army, indorsing it as "possessing much merit," particularly "as a device for obtaining a heavy fire of small arms with very few men; it seems to me admirably adapted to transport steamers plying upon the Western rivers, where infantry squads are needed for security against guerilla and other predatory bands."

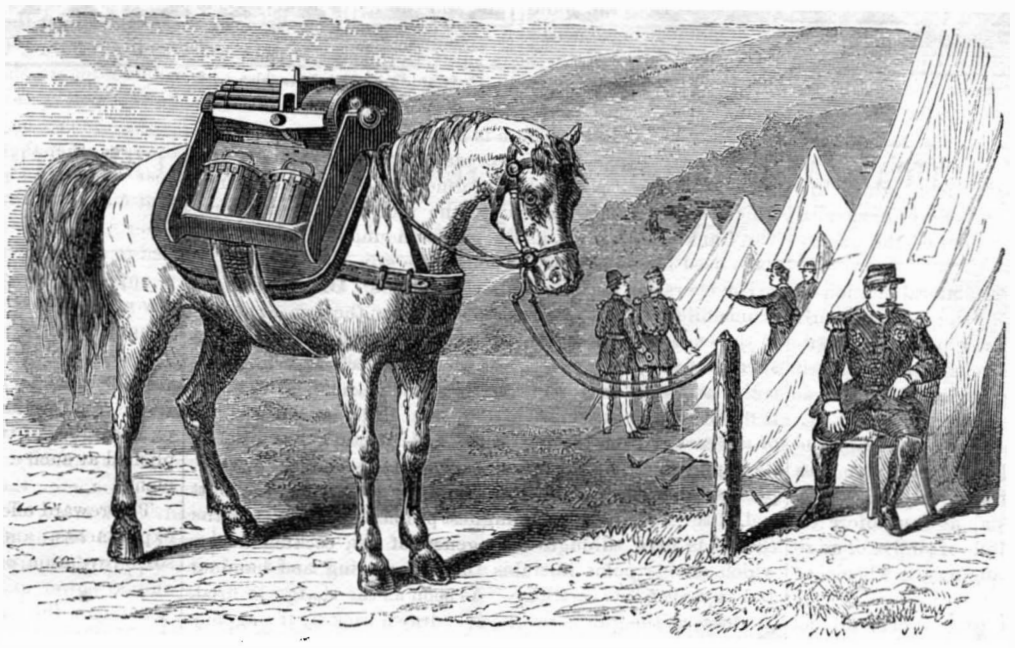
TRIALS BY THE U. S. GOVERNMENT.

Thus brought to the notice of the authorities in Washington, Rear Admiral Dahlgren, Chief of the Bureau of Ordnance, ordered a trial of the gun, which took place in the Washington navy yard. The official report made to him on this occasion, bearing date May 20, 1863, concluded thus:

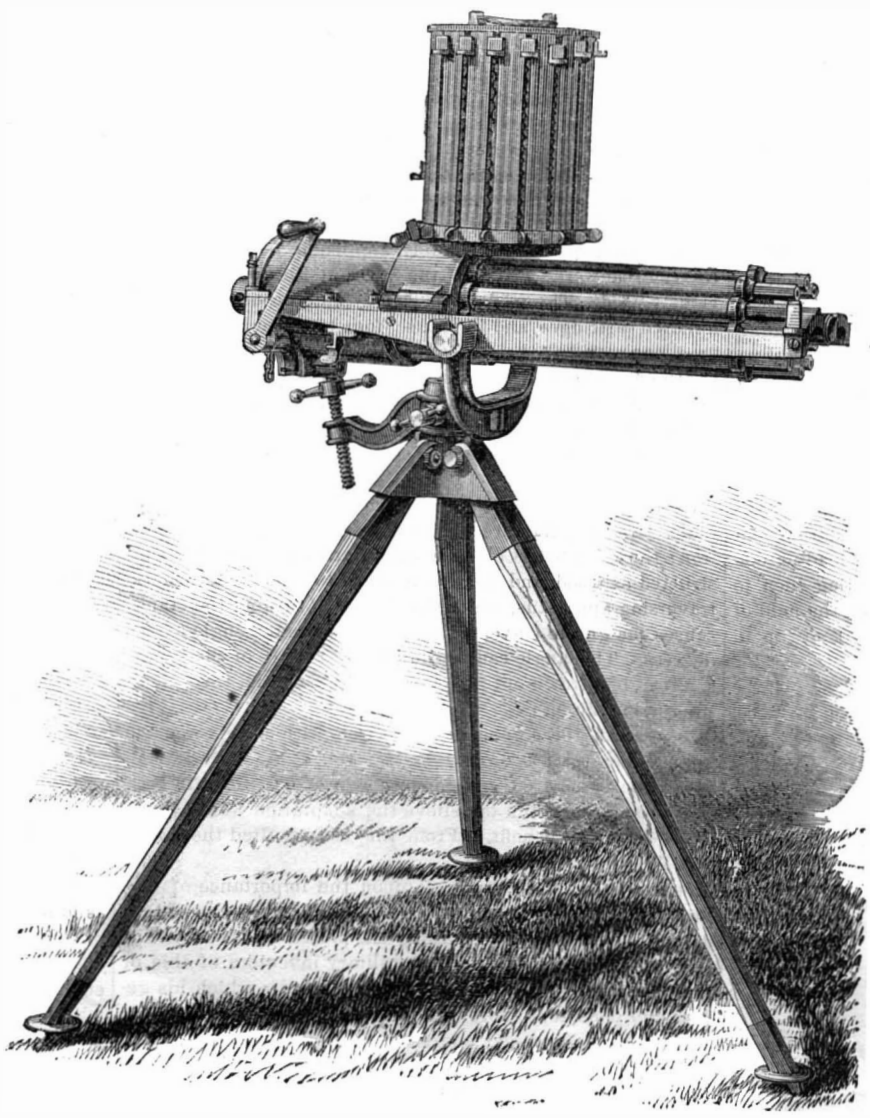
"The gun or battery has stood the limited test given it admirably; has proved itself to be a very effective arm at short range; is well constructed, and calculated to stand the usage to which it would necessarily be subjected. It is suggested that an improvement in the manner of rifling the barrels would be advantageous."

In accordance with the suggestion of this report, Dr. Gatling had a new set of barrels, with a change in the rifling, made and put in the gun; and it was on the 17th of July, 1863, again fired at the Washington navy yard, in the presence of a number of officers. The official report of this trial states that "the penetration of the Gatling battery was equal to that of the Springfield musket;" that the gun in its "mechanical construction is very simple, the workmanship well executed, and we are of the opinion that it is not liable to get out of working order."

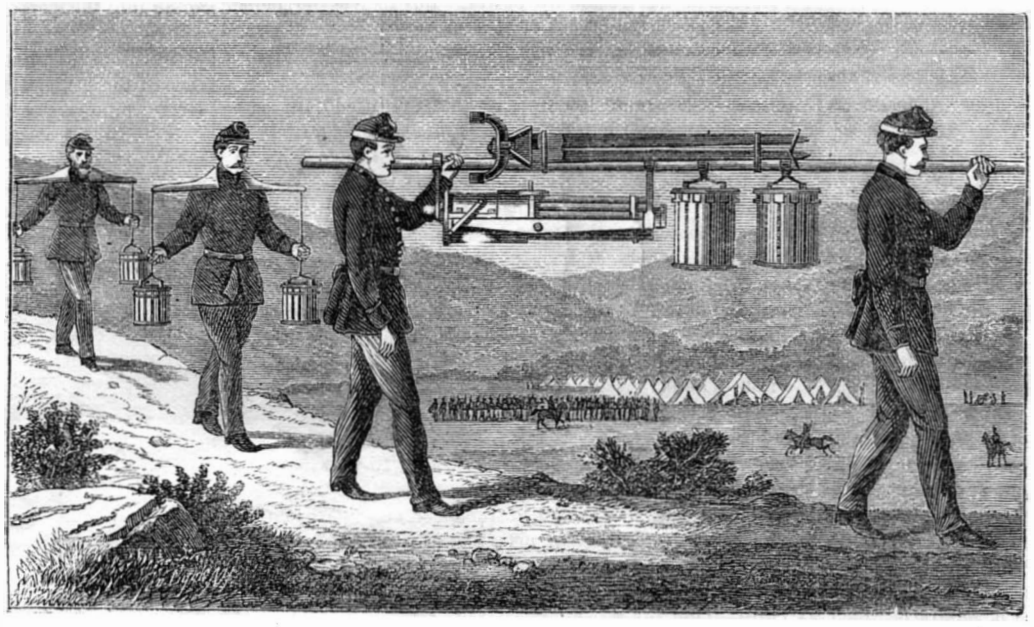
These trials were so satisfactory to Admiral Dahlgren that he gave permission to commanders of fleets and squadrons to order what guns they might think proper for the service; but few guns were then furnished, however, owing to Dr Gatling's inability to make them in quantities, and want of time to see naval officers and impress upon them their value aud true character. But some of them did get into service before the close of the American war, and were used effectively in repelling rebel attacks upon the Union forces under command of General Butler, near Richmond, Va.



THE GATLING BATTERY GUN.—Fig. 2.



THE GATLING BATTERY GUN.—Fig, 3.



THE GATLING BATTERY GUN.—Fig. 4.

VARIOUS OTHER TRIALS AND REPORTS.

Trials in France, in 1867, proved the superiority of the gun over the famous mitrailleuse, but the Emperor claiming the latter as his own, refused to recognize the merits of the American arm so far as to supersede the mitrailleuse by it.

The gun was thoroughly tried by the United States Ordnance Bureau, in 1865, favorably reported upon, and adopted.

In Vienna, in July, 1868, the Military Committee of the Austrian Government gave the gun a trial, which produced a very favorable impression. In this trial the gun fired 246 shots per minute, hitting 216 times, while infantry, firing 721 shots per minute, hit only 196 times.

At Shoeburyness, England, in September, 1870, the gun was tried in comparison with the celebrated nine pounder India bronze muzzle-loading gun, the twelve pounder Armstrong breech-loader field gun, the Montigny mitrailleuse, the Martini-Henry breech-loading rifle, and the breech-loading Snider rifle; the three last at short distances, up to 1,200 yards. Probably no arm was ever put to a severer test than that the Gatling gun endured on this occasion, yet the committee, embracing the highest military experts of the kingdom, made a most favorable report upon it, recommending its adoption. A subsequent exhaustive trial at Woolwich resulted in its adoption by the British Government.

Its merits, thus demonstrated by actual experiment, have secured its adoption by Russia, Turkey, Hungary, and Egypt, in addition to the United States and England.

MAIN FEATURES AND SUPERIORITY OF THE GATLING GUN.

The main features and superiority of the Gatling gun may be summed up thus:

1. Its rapidity and continuity of fire.

2. Its simplicity—there is nothing complex about the gun.

3. Each barrel in the gun is provided with its own independent lock or firing mechanism.

4. These locks are made interchangeable, and are strong and durable; but should they get out of order, the gun is so constructed that any one or all of them can be, in a few moments, taken out and others inserted in their places, and so the gun can be kept in perfect working order at all times on the field of battle. It will not be denied that this is a feature of the greatest value, s the lock mechanism is the most essential part of a machine gun, and is the only part liable to get out of order from use.

5. All the locks revolve simultaneously with the barrels, carrier, and inner breech, when the gun is in operation. The locks also have a reciprocating motion when the gun is revolved. The gun cannot be fired when either the barrels or locks are at rest.

6. The gun is made of single barrels, open at muzzle and breech, with space between them for the free circulation of air and radiation of heat, thus preventing to a great extent that heating and fouling of the barrels which, otherwise, the rapidity and continuity of its fire would cause.

7. The isolation of the barrels makes their expansion and contraction equal and uniform, and thus they suffer no distortion from these causes, as they would if massed together.

8. The barrels are open from end

*Science Record for 1872. A Compendium of Scientific Progress and Discovery during the Past Year. New York. Munn & Co.: Office of the Scientific American, 37 Park Row.

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to end, and can easily be kept clean by the use of a swab or wiper.

9. The cartridges are loaded directly into the rear ends of the barrels; thus all leakage of gas at the breech is prevented.

10. The gun fires a shot at a time in rapid succession, and thus, by dividing the time used in rapid firing into equal parts between the discharges, and preventing an accumulation of recoil, it admits of larger charges, heavier balls, and consequently greater range.

11. This peculiarity of no recoil is of special value in the defenses of bridges, fords, mountain passes, etc., which are frequently attempted during darkness, fog, or storm, as also in the smoke of battle, when the movement of the enemy cannot be accurately observed.

12. Firing a shot at a time also allows a lateral motion of the gun to be kept up during the time of firing, which result is attained in the Broadwell carriage upon which it is mounted, or by the Kinne attachment to the carriage manufactured at Colt's armory, Hartford, Conn., by which the gun is traversed automatically.

13. No resighting and relaying are necessary between the discharges. When the gun is once sighted, its carriage does not move but at the will of the operator, and the gun can be moved laterally when firing is going on, as heretofore remarked, so as to sweep the sector of a circle of twelve or more degrees without moving the trail or changing the wheels of the carriage.

14. The continuous firing, a shot at a time, avoids all deflections of the balls.

15. As musketry fire, the small Gatling can be trained with far more accuracy and delicacy than small arms from the shoulders, and has no nerves to be disturbed in the din, confusion, and carnage of the battle field, nor will the smoke of battle prevent its precision.

16. It requires fewer horses and men to serve it. The weight of the small Gatling is only three hundredweight, of the medium, five hundredweight, and of the largest sized, six hundredweight. Two men serve the first, and from five to seven men the last two. A still smaller sized gun, weighing only one hundred and twenty-five pounds, has recently been constructed at Colt's armory under the supervision of Dr. Gatling, a full description of which is given hereafter.

17. Its great economy, not only in men and horses, but in ammunition.

18. The great safety in the transportation of this ammunition. The cartridge cases or shells for the larger Gatling guns are constructed of sheet metal which is $\frac{15}{100}$ of an inch thick; the heads are made solid, and solder is used in their bases. These shells can be reloaded and fired from fifty to one hundred times. They are also waterproof, strong enough to stand all usage incident to the service, and are safer in transportation, are of less weight, and occupy less space, thus requiring fewer men and horses, for their transportation and service, than artillery ammunition. By carrying loading machines, with extra balls and powder, and detailing men to reload the shells after they have been fired on the field of battle, a supply of ammunition can always be kept up in time of action.

19. The operation of loading is greatly simplified. There is no need of sponging, capping, priming, adjusting of fuses, cocking, etc. All that is required is to supply the hopper with the cartridges and to turn the crank, when a continuous stream of balls can be discharged.

20. The flanges of the cartridges have square faces in front, which enable the shells to be easily extracted from the chambers of the barrels, after they have been fired, by the improved extractors with which the locks are now made.

21. The great range of the large gun, equal for all practical purposes to that of the field gun, and greater, in accuracy and precision, given to it from the use of the elongated leaden bullet, which has great specific gravity and small air resistance.

22. The projectiles of the large gun may be either solid shot, shell, or canister, like those of field artillery.

23. The balls of the Gatling gun ricochet for a greater distance than the shells or missiles of the field piece.

24. The feeding drums and feed cases of the gun can all be used with any gun of the same calibre.

25. The working parts of the guns are encased in the breech covering so as to be entirely protected from dust and bad weather.

26. The largest sized gun, with a range of from two thousand to three thousand yards, can be taken apart, packed on mules, carried across mountains, and on its arrival at its destination can be reassembled in a few minutes.

### DESCRIPTION OF THE GATLING GUN.

The gun consists of a series of barrels in combination with a grooved carrier and lock cylinder. All these several parts are rigidly secured upon a main shaft. There are as many grooves in the carrier and as many holes in the lock cylinder as there are barrels. Each barrel is furnished with one lock, so that a gun with ten barrels has ten locks. The locks work in the slots formed in the lock cylinder, parallel to the axes of the barrels. The lock cylinder, which contains the locks, is surrounded by a casing which is fastened to a frame, to which trunnions are attached. There is a partition in the casing, through which there is an opening, and into which the main shaft, which carries the lock cylinder, carrier, and barrels, is journaled. The main shaft is also, at its front end, journaled in the front part of the frame.

In front of the partition, in the casing, is placed a cam provided with screw surfaces. This cam is rigidly fastened to the casing, and is used to impart a reciprocating motion to the locks when the gun is revolved. There is also, in the front part of the casing, a cocking ring, which surrounds the lock cylinder, is attached to the casing, and has on its rear surface an inclined plane with an abrupt shoulder. This ring and its projection are used for cocking and firing the gun. This ring, the spiral cam, and the locks make up the loading and firing mechanism.

On the rear end of the main shaft, in the rear of the partition in the casing, is located a gear wheel, which works to a pinion on the crank shaft. The rear of the casing is closed by the cascable plate. There is hinged to the frame in front of the breech casing a curved plate, covering partially the grooved carrier, in which is formed an opening through which the cartridges are fed to the gun from feed drums. The frame which supports the gun is mounted upon the carriage used for the transportation of the gun.

The operation of the gun is very simple. One of the feed drums filled with cartridges is placed upon the gun, as shown in the engraving; a man then turns the crank, which, by the agency of the gearing, revolves the main shaft, carrying with it the lock cylinder, carrier, barrels, and locks. As the gun is revolved, the cartridges, one by one, drop into the grooves of the carrier from the feed cases, and instantly the lock, by its impingement on the spiral cam surfaces, moves forward, pushes the cartridge into the chamber, and, when the butt end of the lock gets on the highest projection of the cam, the charge is fired, through the agency of the cocking device which at this point liberates the lock, spring, and hammer and explodes the cartridge. As soon as the charge is fired, the lock, as the gun is revolved, is drawn back by the agency of the screw surface in the cam acting on a lug of the lock, bringing with it the shell of the cartridge after it has been fired, which is dropped on the ground. Thus, it will be seen, when the gun is revolved, the locks in rapid succession move forward to load and fire, and return to extract the cartridge shells. In other words, the whole operation of loading, closing the breech, discharging, and expelling the empty cartridge shells is conducted while the barrels are kept in continuous revolving movement. It must be borne in mind that while the locks revolve with the barrels, they have also, in their line of travel, a spiral reciprocating movement; that is, each lock revolves once and moves forward and back, at each revolution of the gun.

The feed drum has been lately applied to the gun by Mr. L. W. Broadwell. It takes the place of the feed cases previously used. The feed drum is a cylinder, containing four hundred cartridges, and by its use, four hundred shots can be fired, one man only being required to work the gun—that is, to attend to the feed and turn the crank—and all of these shots can be fired in one minute. The ammunition is carried in the drums, and as soon as one is emptied, it is removed and replaced by a full one, the change only requiring a few seconds.

The carriages for the gun which are represented in the plates are manufactured in Europe of wrought and cast iron; those made at Colt's armory, Hartford, Conn., are constructed of wood, and there is attached to them an automatic traversing apparatus, which, by the act of turning the crank, causes the gun to traverse through a maximum angle of six degrees. This angle can be diminished at will, or the apparatus can be thrown out of gear in an instant, and the gun be fired in one direction.

The use of these guns in connection with camels was, we believe, suggested by Col. H. H. Maxwell, R. A., Superintendent of the Cossipore Gun Foundery, whose experience in East India warfare led him to believe the adaptation would prove of the greatest benefit. From this has resulted the camel gun illustrated herewith.

It is needless for us to dwell upon the importance of this gun. All future warfare will be modified by it to an extent difficult to foretell. Mr. Gatling has placed his name on historic record with the greatest military inventors of this or any previous age, and has achieved a success which his genius and persistent effort well merit.

Mr. Gatling's present address is at Colt's Foundery, Hartford, Conn., where the guns are manufactured.

## Steam on the New York Canals.

Last year the Legislature of the State of New York offered a reward of one hundred thousand dollars for the best plan for canal boat navigation by power. But as yet no person has produced the right sort of a plan, and the reward is still open for competitors.

The State Auditor, in a recent report, says:

The Legislature of 1871 passed an act entitled "An act to foster and develop the internal commerce of the State, by inviting and rewarding the practical and profitable introduction, upon the canals, of steam, caloric, electricity, or any motor other than animal power, for the propulsion of boats;" and appropriated for that object the sum of $100,000, to be paid to the owners of the successful plans, not exceeding three in number, which might be submitted for trial, and tested and approved by the commissioners appointed under the act. The act further provides that the commissioners shall demand and require:

First—The inventions and devices to be tested and tried at the proper cost and charges of the parties offering the same for trial.

Second—That the boat shall, in addition to the weight of the machinery, and fuel reasonably necessary for the propulsion of said boat, be enabled to transport, and shall actually transport on the Erie canal, on a test or trial exhibition, under the rules and regulations now governing the boats navigating the canals, at least two hundred tuns of cargo.

Third—That the rate of speed, made by said boat, shall not be less than an average of three miles per hour, without injury to the canals or their structures.

Fourth—That the boat can be readily and easily stopped or backed by the use and power of its own machinery.

Fifth—That the simplicity, economy, and durability of the invention or device must be elements of its worth and usefulness.

Sixth—That the invention, device, or improvement can be readily adapted to the present boats; and, lastly, that the commissioners shall be fully satisfied that the invention or device will lessen the cost of canal transportation, and increase the capacity of the canals. A means of propulsion or towage, other than by a direct application of power upon the boat, which does not interfere in any manner with the present method of towage on the canals, and complying in all other respects with the provisions of the act, may be entitled to the benefits thereof; but this shall not be construed to apply to the system known as the Belgian system, or to any mode of propulsion by steam engines or otherwise, upon either bank of the canals.

Previous to the passage of this act, steam had repeatedly been introduced, by way of experiment, on the Erie and Oswego canals, resulting in a speed of three miles per hour with cargoes of two hundred tuns, but it was only accomplished at such a cost as to preclude its profitable employment.

The reward offered by the State has induced a renewal of experiments, and it is to be hoped that it will result in some invention or device by which some motor other than animal power may be found practicable in the propulsion of boats upon the canals. As yet, the reward has not secured that object. It is believed, however, that it has caused an agitation upon the subject, which will, sooner or later, result in success.

While it would be very desirable to apply steam as a motor to the form of boats now in use, it is deemed by many to be impracticable with the canals at their present dimensions. The paddle wheel and the screw, since the introduction of steam as a motive power, have been the only methods successfully employed in the propulsion of vessels. It is claimed that, with a good propeller wheel working under the most favorable circumstances, as in the open sea, the loss of power amounts to from forty-five to fifty-five per cent; but employed in the canals, the loss rises to seventy and even eighty per cent. If this be true, engines out of all proportion to the work to be accomplished would have to be employed, and hence unprofitable when brought into competition with animal towage.

The employment of tugs might, to a certain extent, be attended with success, but the loss of power adds correspondingly to the cost, which may in a measure be compensated by an increased speed. This method of towage has at different periods been introduced, and the fact of its early abandonment leads to the conviction that it is unprofitable.

It has been suggested that a railroad might be constructed on each side of the canal, and the boats drawn by locomotives. This plan has many advocates, but it is urged against it that the great outlay required to introduce this method renders its adoption impracticable.

The Honorable W. H McAlpine, late engineer and surveyor of this State, in a recent letter from Europe, where he is at present sojourning, mentions a method employed in Europe, and known as the Belgian system, which he had witnessed and believes to be just what is needed on our canals.

This system to which Mr. McAlpine alludes was exhibited on the Erie canal, between Albany and West Troy, previous to the close of the navigable season of 1871. Its operation was witnessed by the State officers and distinguished citizens from different parts of the State.

The system apparatus employed may briefly be described as follows: A wire cable is laid on the bottom of the canal, passing through intervening locks, and fastened at the two extreme ends; and a steam tug or tow boat provided with an engine to which is attached a clip drum, or grooved driving wheel, with suitable guiding and tightening pulleys. The boats to be towed are made fast to the tug, and the process of towing is performed by lifting the cable from the bottom of the canal by means of a grapple, and placing it over the clip drum and under the tightening or press pulleys. The clip drum is then put in motion (turned) by the machinery in the tug, causing the cable to pass over it and fall back again into the canal at the stern of the tug. Thus the tug is drawn along the cable with the same facility as a locomotive is drawn on the rails, though there is no slipping as in the case of the locomotive. All the power of the engine is directly employed in the propulsion of the tug.

It is claimed by the advocates of the system that its general introduction would be attended with complete success in diminishing the time of trips, the cost of transportation, and increasing the capacity of the canals.

This plan of towage appears to have been excluded from competing for the reward offered by the State. No good reason is seen for the exclusion of this or any other apparently practicable system from the benefits of the act. The policy of the act is the encouragement of inventors and others to perfect and test their several plans, and enable the State to select from all that which shall promise the best results. Any plan which will practically combine economy with greater speed than is now attained, and employing the boats at present in use, will not only prevent the diversion of trade, but largely increase the business and revenues of the canals.

To secure such results, the State should offer every encouragement and essential aid, and should exclude no system from her bounty which promises the successful and speedy introduction of steam on her public works. The reduction of time, in making a trip to and from tide water and the lakes, is a matter of the greatest importance, and should receive the most careful attention of the Legislature.

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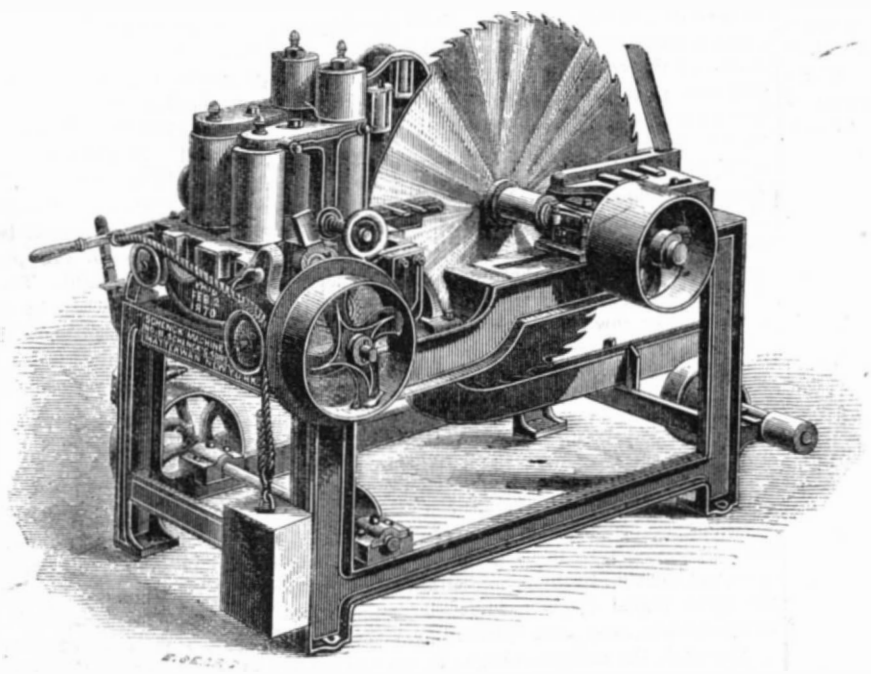
### Improved Circular Re-Sawing Machine and Siding Saw.

Our engraving is a representation of a re-sawing machine, to which was awarded the first medal and diploma at the Exhibition of the American Institute for 1870. The award was made with discrimination and justice, as the machine is undoubtedly one of the best of its kind.

A prominent feature of the saw is that the feed rolls may be set inclined to the saw, so as to saw siding. This adjustment is made simultaneously for all the feed rolls by inclining the table to which they and their gearing are journaled, a set screw holding the table when set, and a simple adjustment compensating for what would otherwise be the increased tension of one of the belts when the table occupies this position.

The feed rolls have an adjustable speed motion through the use of a system of cone pulleys intermediate between the first pulley, from which motion is carried to the feed, and the last, which imparts motion to the gears of the rolls. They are also self-centering, so as to guide the stuff for uniform thickness through all inequalities on each side of the saw; or they may be made not self-centering, and may be held in a fixed position by the adjustment of a single screw.

The machine is constructed in a very substantial and workmanlike manner. It was patented February 2, 1870, and is manufactured by John B. Schenck's Sons, the manufacturers of the celebrated Schenck's planers, at Matteawan, N. Y. The salesrooms are at 118 Liberty street, New York, where the machine may be seen and the firm addressed.



SCHENCK'S CIRCULAR RE-SAWING MACHINE.

### Museum of Natural History.

The Museum of Natural History in Central Park, New York, is rapidly becoming an attractive and important institution. It is open to the public free, and is daily visited by thousands.

Since its first opening and reception last year, many valuable acquisitions have been received; the more valuable being the collection of Prince Maximilian of Germany, which contains a vast number of fine specimens, accumulated by the labors of a lifetime. Beside this collection and the remarkable Verreaux cabinets, a fine specimen of ichthyosaurus has been added. This fossil is imbedded in a slab from the lias formation of Europe, and is one of the most perfect ever found; the plates of its enormous eyeballs are peculiarly distinct. Over 14,000 specimens of birds, besides several hundreds not mounted, are in course of rapid preparation for public inspection and study. A case recently received from Paris contains many finely mounted birds and mammals. Another valuable acquisition is a fossil elk from the bogs of Ireland. This is a perfect skeleton, the antlers being of enormous size. Two very fine specimens of quartz in crystals have lately been presented to the museum. One consists of a block about two feet in diameter, completely studded with prisms from half an inch to two inches in diameter, each prism being perfectly six-sided. A department of building stones has lately been introduced, the design of which is to afford builders and all interested an opportunity to examine at a glance the various building stones of this country and of the world. Other additions are constantly received. A list of the mammals has just been completed and put in the hands of the printer, and a full catalogue will be ultimately prepared.

### Premiums to Locomotive Engineers.

The first duty of railway managers is to secure skilled and reliable employees in every department, and to do this they must pay them well. It may not in every case be possible to give the workmen in the different departments a direct portion of the savings made, due to extra care and skill, as is done in many manufactories and workshops; but it is possible to reward them for these requisites in some manner. When the Philadelphia, Wilmington and Baltimore Railway was operated under the "contract system," pecuniary inducements were held out to all the men to make them careful and skillful, they receiving a percentage of the savings made over a given standard of expense. The system worked favorably to the contractors and the men, the company getting a proportionate benefit from it by the men being better educated to better habits of care, greater skill, and a feeling of responsibility for success in their different spheres of labor. There can be no question that this system, by fostering competitive excellence, was conducive to greater safety in operation, and eventual economy in everything. We learn that the Leavenworth, Lawrence and Galveston railway managers have adopted this system with the most favorable results, by awarding annual premiums to the best performances of engineers for the services following:

1st. For general efficiency and care of engine.
2d. For lowest cost of repairs per mile run.
3d. For best performance per tun of coal and pint of oil.
4th. For least cattle killed in proportion to miles run.

The premium is to be given either in lots or lands of the company—to be located by those receiving them, on certificates to be used as cash for that purpose. Premiums have just been awarded of $150, $100 and $75, under the first head; of $100 and $75 under the second; of $100 and $75 under the third; and $100 and $75 under the fourth; the total amount being $500. In his circular to the Master Mechanic announcing the policy, Superintendent Chanute says:

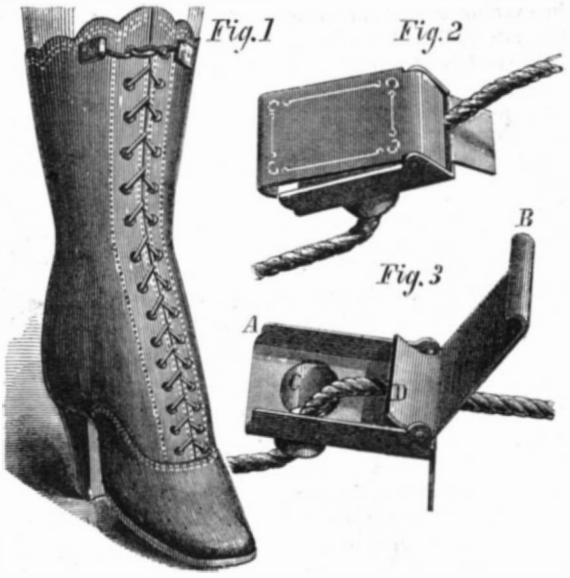
"I have long entertained the opinion that more was exacted from locomotive engineers, in proportion to their pay, than from any other class of operatives on railways. Their post is one of dangers, and on their skill, judgement and fidelity, the safety of the public largely depends. As a class, they thoroughly appreciate the importance of the trusts that are confided to them, and not only do they uncomplainingly endure hardships, exposure and necessary overwork, but they have furnished many examples of self-devotion, as noble as any in history. The past year, all our employees have worked well and faithfully to advance the company's interests. Not a passenger has been killed or injured on our trains, and it is the desire of the management to recognize the zeal with which the service of all has been rendered."—*Railway Times.*

### TRISCOTT AND WHEELER'S SHOE FASTENINGS.

This neat and seemingly very convenient device, for fastening the ends of shoe or boot laces, is claimed to hold them very firmly, and, at the same time, to be tasteful and comely in appearance, obviating both the trouble in tying the ordinary knot, and preventing the annoyance caused by the knots becoming untied.

Fig. 1 represents a shoe with laces fastened as when worn. Figs. 2 and 3 represent the fastenings in different positions.

The device consists of two parts, A and B, which are hinged




together. The part, A, is fastened to the material of the shoe by means of the eyelet, C, and a tongue, which last is passed through the material of the shoe and bent down to hold the part, A, from turning on the eyele. The lateral edges of A are turned up, as shown, so that the part B, shuts down to meet them, like a cover. The forward end of B is turned down at D to press upon and clamp the lace when this part is closed into the position shown in Fig. 1. The opposite end is bent so as to form a spring clasp, which engages the notched ends of the turned up edges of A.

In fastening the lace, the part, B, is turned up as shown in Fig. 3. The lace is then passed through under the pivot joint which unites the two parts, and is then passed through the eyelet, C. B being then pressed down and clasped, the shoe is permanently fastened in such a way that contact with the dress of the wearer cannot loosen it.

The fastening has the further advantage that, one end of the lace being thus secured, the other may be drawn up as tightly as required, a great convenience with some kinds of laces that slip easily.

Patented through the Scientific American Patent Agency, December 26, 1871. For further information address S. P. Triscott, 50 Thomas street, Worcester, Mass., to whom the patent has been assigned.

MR. J. H. COLT, of Oregon Territory, informs us that there is snow twenty feet deep on the Blue Mountains.

### Robertson's Telegraphic Insulators and Brackets.

This invention consists in the use of tubular slotted insulators provided with projecting lugs at the ends, and fitted into a bracket so as to be entirely held therein, the lugs entering recesses provided in the sides of the bracket. The insulator is made of glass or other non-conducting material. At its ends are projecting lugs or ears. The bracket, made of wood or other material, is as thick as the insulator is long between the lugs. It has one or more apertures through it for the insulators to be held in, one aperture for every insulator. To every such aperture in the bracket leads a slit, from front or back. The insulator is fitted through the bracket with its lugs in the slit, and when through is turned so as to bring a slot in line with the slit for the admission of the wire. When that has been applied, the insulator is once more turned to bring the slot out of line with the slit, so as to have the wire entirely inclosed. Staples may be driven over the ears into the countersunk parts or sockets of the bracket to prevent the insulator from turning spontaneously. The wire may be further fastened by a short wire drawn through a hole in the bracket, and twisted about the main wire.

Tubular insulators heretofore used were not slotted, and the wire could therefore only be introduced by being parted and then again united.

In actual work, the advantages and simplicity of this invention are that, the bracket being nailed or otherwise fastened to the post, the wire can be repaired, renewed, or removed without trouble, the slit in the bracket allowing the wire to drop into the insulator hole at once when the slit is in line.

The insulator can at any time be put on, without disturbing the wire, by means of the slot in it, and then pushed into the hole in the bracket, all that is necessary being to keep the lugs opposite the slit in the bracket, and then pushing it in till the lugs clear the bracket; then, by turning the insulator slightly round and putting the small staples over the lugs, (which latter can be done with perfect ease,) the insulator is secured in its place, and the wire effectually prevented from getting out.

To retain the telegraph wire in its place, all that is necessary is to pass a wire through the small hole under the insulator, and fasten it by twisting it to the main wire at each side, and the main wire is effectually retained; the whole process being exceedingly simple and effective.

There is, it is claimed, no risk of the insulator being broken or disconnected, or of the wire becoming disconnected; and any unskilled workman could do all that is necessary in repairing and fixing the line.

Mr. John Robertson, of Carbondale, Pa., is the inventor.

### Noyes' Vacuum Tanks for Tanning Leather.

The object of this invention is to so construct tanks for tanning leather by the vacuum process, and for other purposes, that they will be sufficiently strong when made of wood, and tight enough to preserve the vacuum. It consists in one or more layers of pitch or cement of any suitable kind applied when in a fluid state, so that not only every crack and crevice in the walls and sides of the tank will be filled therewith, but so that the air shall be totally excluded from the tank.

These vacuum tanks have hitherto been made of iron, but it has been found that the tannic acid combines readily with and oxidizes the iron and colors the liquor, consequently coloring the leather, and making it to a certain degree unsalable. These tanks of wood overcome this difficulty, but the vacuum cannot be preserved in a wooden tank except by the use of pitch or cement applied according to this invention, or without one or more continuous and perfect partitions thereof surrounding the chamber on either side.

When the wooden partitions, boxes, or layers are placed, and the exhaust induction pipes are attached, the pitch or cement, in a fluid or semi-fluid state, is poured into the spaces, so as to entirely surround the chamber with one or more partitions, layers, or coats thereof. This hardens directly, excludes the air, and preserves the vacuum, while it preserves the wood from decay.

The inventor does not limit or confine himself to the precise form or arrangement described, as they may be varied in many ways without departing from the invention. Neither does he confine himself to vacuum tanks for tanning hides or leather, but designs to apply the invention to tanks for bleaching or extracting tannin from bark by the vacuum process, and for other purposes.

Mr. D. F. Noyes, of Lewiston, Me., is the inventor.

### Gratitude all Around.

We desire to thank all our good friends who have supplied us, with early numbers of this volume, for the alacrity with which they responded to our call. Hundreds of new subscribers have thus been furnished from the commencement of the year, by the courtesy of those who supplied the numbers, and the publishers are saved the necessity of reprinting.

THERE is a trinity in the communication of heat. It is conducted, circulated, and radiated. It passes through solids by conduction, through liquids by connection or circulation, and from hot bodies generally by radiation.

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### PATTON'S IMPROVED MEAT CHOPPER.

The principal peculiarity in this meat chopper is the movement by which the knife is made to strike in a different position at each stroke. This movement is ingenious yet simple, and only operates when the knife is raised to its highest position.

The knife is caused to reciprocate by a pitman connecting the fly wheel with a collar, A, placed just below the ratchet wheel at the top of the shaft which carries the knife, this shaft turning freely in the collar when not otherwise held.

The pitman extends upward from the collar, A, its upper end carrying a pawl pivoted to the pitman at B, and caused to act positively and surely by the rubber spring, C. D is a spring pawl which works into teeth cut in the perimeter of the ratchet wheel, and holds it from turning except as it is actuated by the pawl pivoted at B.

The oscillation of the lower part of the pitman past the middle vertical axis running through the pivot, A, causes the upper part to oscillate in the opposite direction, and thus operates the pawl, causing the knife to make its stroke in different positions successively.

Patented December 19, 1871. For further information address Joseph R. Piper, Harrisburgh, Pa.

### Machine Forged Horse Shoe Nails.

A correspondent of the *Commercial Bulletin* has paid a visit to S. S. Putnam & Co.'s nail works, at Dorchester, Mass., which he describes as follows:

Here was a busy scene, and the utmost life and activity prevailed in every department. Between 180 and 200 hands are employed on all the different kinds of work, and more than 1,000 tuns of horse shoe nails are annually made in this factory, from the best Norway and Swedish iron, which are sold all throughout the country. The business was established in 1855. The nail factory is 260x60 feet, of both stone and brick, and the machine shop is 100x50 feet. Two steam engines, one 200 horse and the other 20 horse power, propel the machinery, three Harrison boilers are kept in constant use, and the continual clang of 100 nail machines is sufficient to almost deafen the inexperienced visitor. The monthly pay roll reaches between $8,000 and $10,000. The men work "by the pound," and earn from $2 to $5 per day.

Horse nails, from time immemorial, have been made by hand, forged out on the anvil by blacksmiths. In many parts of Europe, whole villages are devoted to this branch of business. The bundle of iron rods is secured by the head of the family, who takes it to his home; and, with the assistance of his wife and children, it is made into horse nails, and the product returned to the capitalist, generally at a depreciation of 25 per cent for waste. For many years these nails found a ready market in this country, under various brands or marks, like "G" or "A" horse nails, as they could be imported at a less cost than our own blacksmiths could make them. Of late years, however, much attention and capital has been devoted to their manufacture by machinery, and Yankee ingenuity has devised various methods to produce a nail equally as good as those made by hand.

Machines have been made, from time to time, to cut the nail from sheets or plates of iron, either hot or cold, but it has been found impossible to produce a nail so compact, firm, tough and strong, as can be made by hammering out on the anvil, whereby the grain of the iron is compacted, refined, and made more ductile and tenacious; although many nails of the former description have come into general use. Some few years since, Mr. S. S. Putnam, of Neponset, conceived the idea of forging horse nails by machinery from the red hot rod, and devoted much time and money to perfecting a machine which would make a nail equal, if not superior, to those made by hand. This invention has proved a success; prejudice and difficulties have been overcome, and nails made by this machine are now in general use all over the country.

### Fight between a Cobra and a Mongoose.

The snake was a large cobra, 4 ft. 10½ inches in length, the most formidable cobra I have seen. He was turned into an enclosed outer room, or verandah, about 20 ft. by 12 ft., and at once coiled himself up, with head erect, about ten or twelve inches from the ground, and began to hiss loudly. The mongoose was a small one of its kind, very tame and quiet, but exceedingly active.

When the mongoose was put into the rectangle, it seemed scarcely to notice the cobra; but the latter, on the contrary, and, putting down its head, tried hard to escape, and kept itself in a corner. The mongoose then went up to it and drew it out, by snapping at its tail and when it was out, began to bite its body, while the cobra kept turning round and round, striking desperately at the mongoose, but in vain.

When this had continued for some time, the mongoose came at length right in front of the cobra and, after some dodging and fencing, when the cobra was in the act of striking, or rather, ready to strike out, the mongoose, to the surprise of all, made a sudden spring at the cobra, and bit it in the inside of the upper jaw, about the fang, and instantly jumped back again. Blood flowed in large drops from the mouth of the cobra, and it seemed much weakened. It was easy now to see how the fight would end, as the mongoose became more eager for the struggle. It continued to bite the body of the cobra, going round it as before, and soon came again in front, and bit it a second time in the upper jaw, when more blood flowed. This continued for some time, until at last, the cobra being very weak, the mongoose caught its upper jaw firmly, and holding down its head, began to crunch it. The cobra, however, being a very strong one, often got up again, and tried feebly to strike the mongoose; but the latter now bit its head and body as it pleased; and when the cobra became motionless and dead, the mongoose left it, and ran to the jungle.

appeared at once to recognize its enemy. It became excited, and no longer seemed to pay any attention to the bystanders, but kept constantly looking at the mongoose. The mongoose began to go round and round the enclosure, occasionally venturing up to the cobra, apparently quite unconcerned.

Some eggs being laid on the ground, it rolled them near the cobra, and began to suck them. Occasionally it left the eggs, and went up to the cobra, within an inch of its neck, as the latter reared up; but when the cobra struck out, the mongoose was away with extraordinary activity.

At length, the mongoose began to bite the cobra's tail, and it looked as if the fight would commence in earnest. Neither, however, seemed anxious for close quarters, so the enclosure was narrowed.

The mongoose then began to give the cobra some very severe bites; but the cobra, after some fencing, forced the mongoose into a corner, and struck it with full strength on the upper part of the hind leg. We were sorry for the mongoose, as but for the enclosure it would have escaped. It was clear that, on open ground, the cobra could not have bitten it at all; while it was the policy of the mongoose to exhaust the cobra before making a close attack. The bite of the cobra evidently caused the mongoose great pain, for it repeatedly stretched out its leg, and shook it, as if painful, for some minutes. The cobra seemed exhausted by its efforts.

The natives said that the mongoose went to the jungle to eat some leaves to cure itself. We did not wish to prevent it, and we expected it would die, as it was severely bitten.

In the evening, some hours after the fight, it returned, apparently quite well, and is now as well as ever. It follows either that the bite of a cobra is not fatal to a mongoose, or that a mongoose manages somehow to cure itself. I am not disposed to put aside altogether what so many intelligent natives positively assert.

This fight shows, at any rate, how these active little animals manage to kill poisonous snakes. On open ground a snake cannot strike them, whereas they can bite the body and tail of a snake, and wear it out before coming to close quarters. This mongoose did not seem to fear the cobra at all; whereas the cobra was evidently in great fear from the moment it saw the mongoose.—*R. Reid, in Nature.*

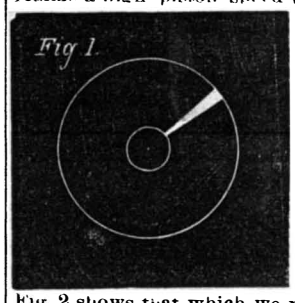
### ROTARY ENGINES.

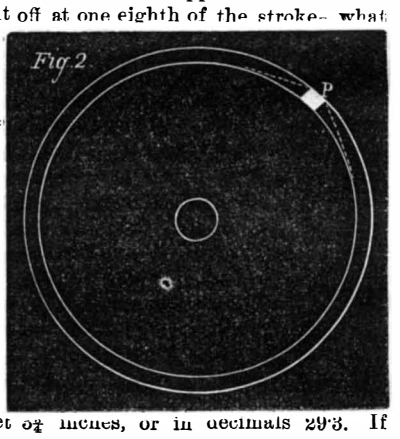
Rotative engines are those in which the energy of the steam produces the continuous rotation of a shaft through the medium of a crank and reciprocating piston. Rotary engines are those in which the continuous rotation of a shaft is caused by the action of steam on a piston or its equivalent continuously rotating within an annulus or steam tight casing. Reaction and impact engines—an example of the latter is furnished by Schiele's steam fan—are also sometimes classed as rotary engines. The rotary engine is a very old invention. One was designed, for example, by James Watt. The records of the Patent Office show that at least 200 separate schemes, for producing motion by the direct action of steam on a piston, have been patented at one time or another. We have no intention of describing any one of these engines, but we may refer such of our readers as are interested in the subject, to a very able and exhaustive review of the best of such inventions, which recently appeared in the shape of a series of papers in a French technical publication, "*La Propagation Indnstrielle.*" The object we have at present in view is simply to explain the principles which should guide inventors who direct their attention to the production of efficient rotary engines, and to point out the true nature of the advantages which would attend the use of such machines if perfectly successful.

There are very few treatises on the steam engine in existence which do not contain an allusion to rotary engines, but the writers, one and all, take particular pains to warn inventors that nothing would be gained by the substitution of rotary for reciprocating rotative engines. This statement is perfectly true in one sense, but it is not wholly true. There is, practically, no loss of power as a consequence of reciprocation alone in the normal steam engine; and it is quite certain that no economical advantages would, within well defined limits, attend the use of rotary engines. But it can easily be demonstrated, on the other hand, that advantages could be derived from the use of a good rotary engine which would well repay the trouble, expense, and skill required to make it. The great point in favor of the rotary engine is that it will permit large measures of expansion to be used to the utmost possible advantage, simply because it places at our disposal a piston speed without any parallel in existing engines. This will become more apparent as we proceed. Strangely enough, it is a point which has hitherto been overlooked by all inventors.

To enter on a long exposition of the defects which exist in all the usual designs for rotary engines would only prove tedious; we therefore propose to explain here the principal features of a theoretically perfect engine, and to point out the difficulties which present themselves when we attempt to reduce this theory to practice. It remains to be seen whether the admirable workmanship of the present day will enable these difficulties to be overcome.

The principal feature in all rotary engines hitherto proposed consists of a piston or its equivalent rotating in a case, the piston being of a length equal or nearly equal to the radius of the circle which it describes in its revolution. The edges of this piston must be packed in some way to keep them tight. There are three edges to be packed; the fourth is made up by the shaft. But a moment's reflection is required to show that the nearer any portion of the packing is to the center the less rapid will be its wear. The consequence is that the packing nearest the edge suffers more than that nearest the shaft, and leakage very quickly ensues. Again, the piston area in such engines is very considerable. The center of effort is not far from the shaft, and any attempt to realize a high piston speed would entail a rapidity of rotation which is inimical to the successful action of the abutment valve or its equivalent. A theoretically perfect rotary engine must have a very small piston, and the center of effort must be located as far as possible from the shaft. The two accompanying diagrams will make our meaning clear. Fig. 1 shows the old form of rotary engine; Fig. 2 shows that which we propose as being in theory infinitely superior. Let us suppose that the diameter of the outer ring in Fig. 2 is 10 feet, the diameter of the inner ring 9 feet 4 inches. The piston, P, will then be 4 inches deep, and let us further suppose that it is 2 feet wide, with semicircular ends. The area of such a piston will be in round numbers 86 square inches, Let us suppose that steam of 100 lb. pressure is cut off at one eighth of the stroke—what a stroke means we shall explain presently—and that, deducting back pressure, the effective average pressure is 30 lb. Then we have for the whole pressure on the piston 86 × 30 = 2,580 lb. Now, the circumference of a circle 9 feet 8 inches diameter — that described by the center of effort of the piston—measures 29 feet 3¼ inches, or in decimals 29·3. If our engine makes sixty revolutions per minute, we shall have a piston speed of not less than 1,758 feet per minute, and




$$\frac{1758 \times 2580}{33000} = 137 \text{ H. P.}$$

Thus we have an engine occupying a little more space than the fly wheel alone of an ordinary 10 horse engine, which may nevertheless give out 140 indicated horse power with ease. Into questions connected with the arrangements required for packing such an engine and keeping the joints tight, we shall not now enter. We are dealing at present with principles, not with details, We shall, instead, proceed to examine a most important feature, namely, the means to be adopted in providing an abutment for the steam. In very many rotary engines of the old type, a simple flat-sided sliding valve is used as an abutment, and the consequence is a great loss of useful effort. Move this valve as quickly as we will, it is simply impossible to get it out of the way of the advancing piston and into position again behind the piston without leaving a very considerable space between the two. Even if we suppose the sliding abutment to have the same velocity as the piston, we find that it cannot, in such an engine as we have described, be completely closed until the piston has moved 4 inches away from it. This 4 inches represents clearance, and all clearance is waste in a rotary engine, because, unlike the reciprocating engine, there is in all rotary engines hitherto designed no compression. It is obvious that the abutment should not be withdrawn till the last moment, and that it should be replaced as quickly as possible. Suppose that the withdrawal and replacement are effected while the piston—including its own length—has moved over 2 feet; then as the piston is moving at the rate of, in round numbers, 30 feet per second, only the fifteenth part of a second will elapse while it is running over two feet; and it follows that a heavy mass of metal must be jerked out, brought to a dead stop, suffered to pause while the thickness of the piston is passing, and jerked in again through a distance of about 5 inches in the fifteenth part of one second, and this operation is to be repeated every second. We have no hesitation in saying that this is practically impossible.

But it is not impossible to contrive a form of abutment which shall be either a sliding valve or its equivalent, and

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yet comply with the required conditions: and it is to scheming such an abutment that inventors of rotary engines should direct attention. We may throw out the hint that, by prolonging the piston backwards and forwards, and sloping it off as shown by the dotted lines in Fig. 2, much of the clearance may be saved, and a modification of the form of the valve or abutment may also be adopted to produce like results; but in a succeeding article we shall consider this point more at length. The ordinary remedy is to provide two abutment valves, one remaining closed during half a revolution, while the other is opening and closing again; but a moment's reflection will show that this plan is only applicable to engines working absolutely without expansion, and would entail enormous waste in engines in which steam was cut off much before the end of the stroke, a stroke being represented by the travel of the piston from abutment to abutment.—*Engineer.*

### Process of Germination.

An eminent writer upon the subject, in speaking of the action of the sun in this great work of germination, remarks:

"Upon the chemical influence of the sun's rays depends the germination of seeds as well as the growth of the plants. We bury the seed in the ground and shut it out from the influence of light, but we do not place it beyond the reach of the sun's actinic influence, for that penetrates like heat to the little earthy couch where the embryo plant lies hid, and arouses it into life. Light, or the luminiferous rays of the sun, so important to the well being of the plant, is actually inimical to the excitation of vitality in the seed. How singular is this fact! A series of carefully conducted experiments has proved that seeds will not germinate in light, although supplied with heat and moisture, when the actinic rays are cut off. Deprived of the luminous rays with the actinic in full force, they spring into life with great rapidity. Seeds sown upon the surface of the earth will scarcely germinate, as soil cultivators very well know, and, on the other hand, seeds buried so deep that the actinic rays cannot reach them will certainly perish. The planting of seeds, so as to secure the proper distance below the surface, is a most important point in husbandry, as it has much to do with the early starting of the plant and the success of the crops."

## Correspondence.

*The Editors are not responsible for the opinions expressed by their Correspondents.*

### The Wonderful Curiosity---The Flexible Marble of Wheeling, Va.

*To the Editor of the Scientific American:*

My attention has been called to a "Wonderful Curiosity" in your issue of the 17th inst., and I deem it not improper to give you some facts which may not have been in your possession at the time you penned your comments on the *Intelligencer's* article. I am the owner of the curiosity, and know what I say when I assure you that it is a common slab, of the dimensions named, from the Portland quarries, Vermont. It was purchased at one of the marble cutting establishments of this city, like hundreds of similar specimens of the same mineral, from the same quarry, which are kept constantly on hand by all our marble cutters. It was originally sawn for tombstone purposes, and its flexibility was not discovered until after its removal from the *débris* of the burnt college edifice at Moundsville. In proof that it is marble, and not itacolumite as you have supposed, I hand you herewith, from the Pittsburgh *Dispatch*, February 8th, an analysis of the specimen, made by Professor George Hay, Q.S., Professor of Chemistry in the Western University of Pennsylvania. With the value of his opinion, you are no doubt entirely familiar. J. A. HOLLIDAY.

Wheeling, West Va., Feb. 20, 1872.

ANALYTICAL LABORATORY, 25 Diamond Square,
ALLEGHENY, Pa., February 7, 1872.

J. HOLLIDAY, ESQ—Dear Sir: I have, at your request, carefully analyzed a portion of the flexible marble slab, now in your possession and on view at 22 Fifth avenue, Pittsburgh. Its constitution is as follows:

| | |
|---|---|
| Carbonate of Lime | 97·50 |
| Magnesia, a trace | |
| Silica | 2·05 |
| Water | ·45 |
| Total | 100·00 |

The above composition and its crystalline character together proclaim it to be a true marble, and, at the same time, a pretty pure specimen of that mineral. The indubitable flexibility of the slab is its most remarkable feature. Dana states that "some of the West Stockbridge marble is flexible in thin pieces when first taken out." The slab in the possession of Mr. Holliday is about two inches thick, and is nearly as flexible as an equal thickness of vulcanized india rubber. I shall not attempt to explain the flexibility of this extraordinary slab. It may be due to a species of ball and socket movement among the minute crystals which compose the mineral, or it may be due to molecular motion alone; I cannot tell. Certain it is, however, that the slab consists of marble, nowise different in chemical constitution from ordinary marble, and possesses an unusual degree of flexibility for marble which has been so long out of the quarry. Those who are interested in what is curious or strange in Nature should go and see this remarkable slab. I am, &c.,

GEORGE HAY, Q. S.,
Professor of Chemistry in the Western University of Pennsylvania.

### The Models at the Patent Office.

*To the Editor of the Scientific American:*

In your issue of February 10th, you ask: "What shall be done with the models at the Patent Office?" No one but an inventor can appreciate the advantage of a fair opportunity to examine models of other inventions in his line.

To be obliged to depend upon drawings alone would add to his labor an hundred fold. As it is, he can find and examine everything of interest to him. He does not expect or wish to go over the whole collection, any more than he would wish to examine every book in a library of reference; but, being directed by courteous assistants, he can spend hours or days in the pursuit of the knowledge he desires, and save himself months of thought and labor on some invention which has perhaps long been patented unknown to him. In answer to your question, I say: Preserve them; erect new buildings as often as necessary. Invention and discovery are the life of America. Let nothing be done to impede them or make them more difficult. B.

### Models at the Patent Office.

*To the Editor of the Scientific American:*

I am heartily glad to see you come out squarely against the costly farce of requiring to be deposited models of every invention for which a patent is asked. To see that it is a farce, an inventor has but to go and examine his own specimens after only a few years. He will find them beautifully misrepresenting his invention, as I have done, broken, parts reversed, inverted, transposed and lost. They may have been useful, and even necessary, in the early days and at the origin of the patent system in this country. Those days are past. Good drawings are easily and cheaply obtained, and if, with good and profuse illustration in drawing, the examiner is incompetent to fully and completely comprehend a machine, his place should be filled with one better qualified. Drawings do not allow parts of machines illustrated to be lost, misplaced, transposed, or substituted. Drawings do not have to be unscrewed, unbolted, taken to pieces, chipped, filed, or oiled, to make them do their work of illustration. With drawings, the different movements do not have to be examined in rotation, but may be seen, compared, and comprehended at a glance. So also with the construction of internal parts. They are more portable, occupy incomparably less space, can be arranged in more systematic and convenient order, are more accessible, less liable to injury, and cost the inventor, in most cases, much less.

In short, I believe there can be no one sound argument used in favor of models, unless it be the (inexcusable) incapacity of examiners. INVENTOR, No. 2.

### A New Building Material---Bricks of Slag.

*To the Editor of the Scientific American:*

To call bricks a new building material is perhaps hardly correct, when every child knows that brickmaking dates as far back as the Israelites in Egypt. But bricks, like everything else, have undergone various changes in form, material, and manufacture. Whether these changes have had a tendency to improve the Egyptian brick is a question not so readily answered. The bricks manufactured by the Egyptians were intended to last for ages, and in this respect they have certainly answered their purpose. With our modern brickmakers, it is different. The inferiority in modern bricks consists principally in the bricks being made of cheap material and badly or insufficiently burnt, and the consequence is that they will not withstand the wet or the hard frosts. This principle of manufacturing an article which is to last for a limited time only is far from being conducive either to safety, durability or comfort. It is precisely with the view of meeting these all-important considerations that the material now introduced to the public has been invented and patented.

Mr. J. J. Bodmer, of London, has discovered a new method of making bricks from a material hitherto treated as refuse only, and the removal of which had to be effected at considerable expense. This material is simply blast furnace slag.

A careful analysis of the slag of a blast furnace showed a great similarity with the well known puzzolana, and this fact suggested to the discoverer the idea of manufacturing a cement by incorporating the slag with a certain proportion of lime. The very first experiment succeeded, as far as the quality of the cement was concerned. It set somewhat more slowly than Portland cement, but it attained a similar degree of hardness, especially under water. The blast furnace slag, however, had proved to be so hard that it was quite evident the manufacture of the new cement could never pay unless an improved method could be adopted to deal with the slag. In watching the slag as it flows in a half liquid or viscous condition from the furnace, the idea occurred to the inventor: "Why should the slag be allowed to form lumps and get hard? Why not subdivide it in its viscous, plastic condition?" The difficulty of reducing the hard slag was thus solved. A pair of plain rollers were put under the spout of the furnace instead of the large tub, which was formerly used to receive the slag. Sufficient speed was given to the rollers to receive and take through the whole off flow issuing from the furnace; and by giving the rollers differential velocity, the slag fell from them in the shape of thin scales or flakes. These were found to crush as easily as sugar, and by grinding such slag, together with the proper proportion of lime, the cement was obtained at a mere nominal cost. This cement, in a proportion of 2 parts to 6 parts of sand, makes the finest bricks imaginable. At iron works, slag is again used in lieu of sand; it is rolled coarser and then mixed with the cement like sand, and the bricks obtained are as hard as flint and of a most pleasing color, being that of grey sandstone. The color can, however, be varied *ad libitum*, from a light to a very dark shade. Nor is the material adapted for the manufacture of bricks only, but may be used for blocks or ornaments of every description, as the cement itself may be used in the same manner as the Portland cement. For the purpose of manufacturing blocks and ornaments, a somewhat different *modus operandi* must be observed. If the attention of the owners of some of the large iron founderies of New York or Pennsylvania could be drawn to the subject of brick manufacture from slag, they would find that this hitherto useless material can be turned to profitable account, producing a brick which would prove both cheaper and harder than any other made. A conspicuous feature of these bricks is that they resist the action of the weather, and do not crumble away like most of the clay bricks, a defect from which even the brown stone is not exempt.

The idea of using slag as a building material is not altogether an original one. When the slag is allowed to form large masses, the inside of such blocks cools very gradually and thereby attains the hardness of rock. Such blocks are used, in iron manufacturing districts in England, for foundations, sea walls, &c.

A special feature, too, is the machinery used in the process of brickmaking. The cement and the sand or coarse slag are shovelled into their respective receivers or hoppers, and at the other end of the apparatus, the finished bricks rise to the table, from which they are wheeled away and piled up to set and harden in the open air. The manufacture of bricks from blast furnace slag is covered by letters patent taken through the Scientific American Patent Agency.

Messrs. Bodmer & Co., of Hammersmith, London, are now manufacturing these bricks, and would like to correspond with parties in the United States with a view of introducing the manufacture here. Should any of the American iron manufacturers be present at the great annual meeting of the Iron and Steel Institute in London, in March, 1872, they will have every opportunity to see the process in actual operation.

[The above communication is from a valued correspondent in London, describing a novelty in brick which was patented in this country, and which was briefly referred to in these columns at the time the patent was issued.—ED.

### The Davenport Tricks Again.

*To the Editor of the Scientific American:*

Now that Messrs. Vander Weyde and Patton are about explaining the operations of the Davenport brothers, I hope they will make their explanations as brief, exhaustive, and comprehensive as possible, for the benefit of science. I was once one of a committee of three, chosen to investigate these performances. We proceeded in the following manner: First, we placed eight inverted glass tumblers upon the platform; upon these we set the legs of two light benches, and upon the benches we set up their cabinet, made of thin black walnut boards. We then with strong hemp cords made first two turns around one wrist of one of the brothers, and tied him with a strong square knot; and then tied the other in the same manner. We then pinioned their hands and arms firmly behind their backs, then ran the ends of the rope through holes in the seat, and drew their feet back and secured them firmly to the seat, winding the ropes around their legs and knees, and fastening with a strong square knot, leaving no slack rope anywhere. We also tied their heads back to the cabinet. We then made them open their hands, and placed in each a good teaspoonful of wheaten flour, taking great care that not a particle be dropped inside the cabinet; then, closing their hands, we sewed the ropes and knots through and through with strong linen thread. When thus secured, we placed a speaking trumpet, three or four bells, a violin and guitar in the cabinet, and closed the doors, hooking the two outside doors, the middle door being bolted inside instantly after closing. Immediately the instruments began to be played upon, all together; a hand and half of a naked arm were thrust out through a hole near the top of the middle door, swinging a bell for several seconds, and throwing it upon the floor. Then another hand and arm thrust out the speaking trumpet. This time I seized the hand near the wrist and did my best to hold on to it by pulling downward, but with a power greater than my own, it drew back into the cabinet with a loud grating noise as it rubbed on the edge of the board under the weight of my grasp. The hand was warm, but it left no marks of skin or blood upon the sharp edges of the opening. Immediately after, a head and neck rose through another opening in the top of the cabinet and was plainly visible for several seconds to all the audience. After these things had been going on some time, the doors were thrown open, and we made an examination of things within, but we could discover no change in the tieing of the brothers, the flour still being in their hands as we left it, and no marks of it upon anything in the cabinet. We then proceeded to close the doors a second time; one other of the committee closed the door at the right. While I was fastening the door at the left of the cabinet, a hand struck me with great force upon the left shoulder; I instantly turned to see who did it, and the hand appeared to vanish over the shoulder of one of the brothers. The hand was seen and the force of the blow plainly heard all over the hall; we threw open the doors, but no change could be found in the condition of our ropes or prisoners. We then closed the doors again, and, inside of four minutes, they were thrown open and the brothers stepped out, still holding the flour in their hands undisturbed, the ropes lying upon the floor of the cabinet, but their marks deep in the wrists of our "no longer prisoners."

These things were performed in the presence of at least 250 witnesses in New Haven, Conn. Now, Dr. Vander Weyde says he has performed certain tricks repeatedly and "done everything the Davenports did," etc. If he will come to New Haven and perform everything the Davenports did, under like conditions, and give us a satisfactory scientific explanation of the *methodus operandi*, as he calls it, I stand ready to hire a hall and pay all expenses, and pay him well for his trouble, for the benefit of science.

New Haven, Conn. GEO. T. CALDWELL.

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### Borax in Nevada.

*To the Editor of the Scientific American:*

Some years ago Professor Silliman traveled through this section of country, and made an analysis of the many different minerals found in Nevada, and also made a report of the same.

William Troop, of California, got hold of some of his reports, and learned by them that the Professor had discovered a saline marsh, near the Carson river, of some 2,000 acres, which contained traces of borax. He at once prospected, but met with little success, and the marsh lay unclaimed and unnoticed until last May, when Mr. Troop and others located according to law. Since that time I have become interested in the affair, and put up small works and manufactured five tuns of borax and placed the same upon the market. The article is merchantable, and has a ready sale; and the demand is increasing.

Our crude material has an incrustation upon the surface, and is called borate of soda. From what little knowledge of chemistry I have, I believe it contains boracic acid, soda, salt, magnesia, and ammonia, but may be mistaken as to the last named.

In looking through the SCIENTIFIC AMERICAN for 1869, on page 202, I find some interesting information entitled "Ammonia and its uses in the arts." That article states that the most recent supply is from the boracic acid works in Italy, and that they had until recently lost a million of pounds of salts of ammonia during a year.

I have been paid double the price of the SCIENTIFIC AMERICAN, almost monthly for the last five years, by reading the many communications on different subjects; and I am desirous of knowing the best method for manufacturing borax from borate of soda; the best method of separating an excess of soda from the borax in concentrating; how to separate magnesia from borax, and also the best method of manufacturing ammonia.

If some of your readers will give me a description of the works at the Tuscan lagoon in Italy, and the manner of working, and the kind of material worked there, they would confer a great favor upon me and many others.

I am informed that these are the greatest borax works in the world. J. V. LEWIS.

Nevada, Jan. 17, 1872.

### Technical and Classical Education.

*To the Editor of the Scientific American:*

In looking over the SCIENTIFIC AMERICAN for the past year, I notice a prevailing tendency towards technical education. I am glad that this is so; but while we consider the value of a technical education, classical studies should not be neglected. To be successful in any calling, a man must have a well balanced mind; and a mind certainly cannot be well balanced which has continually run in one channel. It may be good in certain points, but problems are continually coming up, in the course of a man's life, which require other faculties of the mind than those which a technical education is likely to develope. To educate the other faculties of the mind will not require a very deep insight into classical learning; but a little cannot injure any one in his scientific attainments, and will undoubtedly add to his general culture.

The above is not intended to decry technical education in the least. But at this time it has so many able advocates that we may be in danger of running into extremes on this subject, and to neglect classical education entirely.

PRINCETON, N. J. M.

### Shaving with Pumice Stone.

*To the Editor of the Scientific American:*

I see by your No. 4 that nothing useful is so small as to escape your vigilant attention. I allude to instructions for easy shaving. This leads me to say that shaving with an expensive tool like a razor is all nonsense. The proper way to keep down the human stubble is to get two pieces of of pumice stone, cubes of one and a half inches. Keep them clean by rubbing their faces together; then rub them over your own face, that is all; no soap, no brush, no razor costing originally $1·50, and giving the seller a regular annual income of at least fifty cents in sharpening, no Emerson's patent strap required, no looking glass, no hot water. In traveling you have only to sit still and move the cube around; the shaking of the car, carriage, horse, donkey, or boat will do the work clean.

The moral effect of pumice stone can be imagined when you think of the statistics on suicides by razors, the vituperations of irascible men with hard beards when their razors do not cut smoothly, or when they shave with bad water, bad soap, or by a bad light.

Many other considerations for giving up the razor might be named, if time and space would permit; but I must content myself on giving you this hint on domestic and, I may say also, political economy. * * *

### Watch Cleaning.

A correspondent says: "To clean a watch, even if it be of the lowest grade, the barrel or mainspring box should always be taken apart, the arbor and spring taken out and cleaned, fresh oil being applied before the cover is replaced. That there is nothing better than naphtha for cleaning purposes, is the opinion of most watchmakers. If the watch has a fusee, that also should undergo the same treatment as the mainspring box. The pivots also form an important part of the mechanism of a watch; and, to be examined as they always should be, necessitate the act of taking the watch apart. Such attention, no honest practitioners will overlook."

THE population of London, by last year's census, is 3,883,092.

[For the Scientific American.]

### MIDDLE PARK, COLORADO.

Colorado is the apex of the United States; within her borders is the culminating point of the Rocky Mountains. Here are those huge vertebræ of the continental back bone, whose cloud-piercing, cloud-compelling summits collect the snow and distil the water to form those mighty rivers—the Platte, the Arkansas and the Colorado—which, flowing to the two oceans, begin their journey in the eternal snows of the dividing range. Beyond the boundary of Colorado the mountains become less abrupt, lose one third of their altitude, and, stooping as it were, form a passage for the iron pathway of the nations.

The main range in Colorado is flexed and doubled upon itself like a huge anaconda; within one of these immense folds lies Middle Park.

It is a region but little known outside of Colorado. There are several reasons, mostly negative, that will account for the meagerness of our knowledge of this gem of American mountain scenery. The principal reason is that the precious metals have never been found here in paying quantities. How little would be known to-day of the greater portion of our western Territories, but for the presence within their borders of gold and silver, those powerful lodestones of humanity!

Middle Park lies on the western or Pacific side of the great continental divide, and is about sixty miles long from north to south by twenty-five miles in breadth, with an area about equal to that of Rhode Island.

An immense wall of granite, porphyry and queissoid rocks bounds the Park on every side, rising from 3,000 to 7,000 feet above the surface: Long's Peak, with its 14,000 feet of altitude, forming the north-east corner stone. The altitude of the park proper is from 6,000 to 8,000 feet above the sea. Middle Park is drained by Grand river and its tributaries; the Grand rises near the base of Long's Peak, and, flowing diagonally through the park, passes out at the south-west corner.

This river is one of the principal branches of the Colorado, and its waters, after flowing through the three hundred mile cañon of that stream, finally reach the Pacific by way of the Gulf of California.

The surface of Middle Park is, for the most part, rough and hilly, the hills frequently becoming mountainlike in their proportions.

Some of the streams are bordered by broad, level savannas, covered with a dense growth of sage brush. This tough, aromatic plant grows here from one and a half to two feet high, and is very abundant in most of the Territories west of the Rocky Mountains; but no true sage brush has ever been found east of the main range. The spherical cactus or, more scientifically, *cactus mammilacis* grows in the more arid portions of the park. There is but little timber in the park proper, and that is generally confined to the summits of the higher hills; the foot hills of the mountains, however, are covered with forests of pine. Grass is abundant and so nutritious that cattle and horses require no other food, summer or winter. The climate in summer is pleasant and exhilarating, though there is more or less frost every month in the year.

In nearly the lowest part of the park, your correspondent noted a temperature of 22° Fahr. at 6 A. M. August 28, and for a week the temperature at this hour averaged as low as the freezing point.

One thing to be said in favor of this climate, however, is that frost has not the same blighting effect upon vegetation in this rare, dry atmosphere that it would have in the damp, dense atmosphere of the States. It is a well attested fact, improbable as it may seem, that flowers and even strawberries will mature, in the open air, in this elevated region where there is frost every week in the year. The annual snow fall is from 12 to 15 feet, commencing in September and ending in May.

The fauna of Middle Park include deer, coyotes, trout, mountain hares, beavers and Indians; the latter are rather scarce in summer, but infest the park in considerable numbers during the winter. Trout are the principal fish found in the lakes and streams. Beavers are abundant, and their dams may be found on most of the smaller streams. On one stream there are fifty or more beaver dams within a mile, a regular beaver city.

Near the head of Grand river, just within the foot hills of the mountains, lies Grand lake, a beautiful sheet of water, of small area and great depth; though not more than two miles long, a sounding line of five hundred feet failed to reach bottom. It is set as a mirror in a framework of mountains, which rise abruptly from the water's edge. The altitude of the lake, as determined by the temperature of boiling water, is 7,551 feet above the sea.

Grand river forms at once its inlet and outlet. Up through the cañon, where the river comes tumbling down, are several smaller lakes; and higher still is Estes Park, a wee bit of a park on the verge of timber line, wearing its mantle of green grass and beautiful Alpine flowers 11,000 feet above the sea and in close proximity to the eternal drifts.

The hills along all of the larger streams are terraced. There are generally three terraces, very distinct and regular, rising steplike to a hight of two hundred or three hundred feet.

The geology of the park is unique, and forms one of its most interesting features. All the formations known in America, from the azoic to the later tertiary, are represented here. It is a well established principle of geological science that, generally speaking, the highest mountains are the youngest, and *vice versâ*. Thus the Adirondacks of New York are the oldest and the Rocky Mountains are the youngest mountains in the United States; while the Green Mountains and the Appalachians occupy intermediate positions in point of time.

At the close of the cretaceous age only a few isolated ridges of azoic rocks appeared above the waste of waters of the great interior sea, and the elevation of the Rocky Mountains was just beginning. But early in the tertiary age communication with the exterior ocean was cut off, never to be resumed; and fresh or brackish water lakes took the place of the previous interior sea. Middle Park probably formed the bed of such a lake.

The great thickness of tertiary rocks over the Rocky Mountain region proves that this lacustrine condition continued for a long time. The stratified rocks of Middle Peak form an immense quaquaversal; this is the natural result of the elevation of the mountains after the deposition of the strata.

Tertiary rocks are found high up on the flanks of the mountains, above timber line and 12,000 feet or more above the sea; this shows conclusively that the Rocky Mountains received most of their present altitude after the beginning of the tertiary age.

The tertiary beds are composed of soft, light-colored sandstones and marls, alternating with conglomerates and some laminated, argillaceous beds.

The absence of limestone and marine fossils from this formation is evidence that the water in which the beds were deposited was fresh or nearly so.

Fossil wood is abundant in the rocks of this age; fossil palm trees are recognized by their characteristic endogenous structure, but most of the trees were exogens. In the argillaceous beds mentioned above are many impressions of fossil leaves. A species of magnolia has been identified.

The presence of the remains of these tropical plants in this semi-arctic region is some indication of the great climatic changes that have taken place over the surface of the globe, within quite recent time, geologically speaking.

In the valley of the Blue river, the cretaceous beds have an immense development, and they follow this stream nearly to its source, running high up on the mountains, where the beds have been broken and faulted on a grand scale. Marls and shales are the predominating rocks. In the shale I found *boculites* (cephalopod molluscs) and *inoceramus* (a species of *conchifer*), fossils characteristic of this age.

The carboniferous beds of Middle Park contain the only true carboniferous coal in Colorado.

During the closing epochs of the tertiary age, there was a stormy time, strongly marked in the rocks of this era; fire and water united to leave an indelible impress upon the land.

In Middle Park, there were extensive eruptions and overflows of igneous rocks—basalt and lava—forming a number of well defined *mesas*, whose frowning battlements form an interesting feature in the topography of the park. The most remarkable of these eruptions occurs fifteen miles below Grand lake. Grand river cañons here (making a verb of the noun). The cañon is an enormous gorge cut through a high ridge of basaltic rocks. The ridge is from 800 to 1,200 feet high, and seems to be an intrusive bed, for it is conformable to the sedimentary beds above and below.

The underlying cretaceous shales were converted into slate by the metamorphic action of the fiery mass.

The hot sulphur springs still bear witness to this geological storm. They are situated near the center of the park on the west bank of Grand river, and form the chief attraction of the park at present.

The water issues, from the ground, strongly impregnated with sulphuretted hydrogen, and flows into a capacious basin, of its own handiwork, which forms an excellent tub.

The volume of water is about twenty-five inches, an inch being the amount of water that will flow through an orifice one inch square under six inches head. The temperature of the water is 112° Fahr., which indicates that it comes from a considerable depth, and an analysis of it would probably afford some clue to the mineralogical character of the rocks for a long distance below the surface.

The monumental rocks in the valley of Troublesome Creek are interesting examples of the erosive action of water and frost. During the lapse of ages, the original sandstone beds have been worn down and cut out by the degrading elements, leaving these strange, weird monuments to be the wonder of the world.

Near the mouth of Troublesome Creek is a rectangular hill, about 200 feet high, composed of light colored marl and sandstone; the sides are nearly perpendicular and have been so fashioned by the elements that the whole resembles a huge castle. The resemblance is quite complete; towers, abutments, massive gateways, all are here. When seen by moonlight or in the early morn, the effect is enchanting.

The quantity of agates, jasper, chalcedony and silicified wood in Middle Park is sufficient to supply the world. Agate and chalcedony are found in the volcanic rocks, and were formed by the deposition of silica in the vesicles of the lava; the subsequent disintegration of the lava leaves the minerals free. There are thousands of acres in these agate patches. Much of the agate contains that dendritic formation of the oxides of manganese and iron, supposed by some persons to be petrified moss, which gives it the name of moss agate.

The Park is much visited by Coloradoans during the summer, but the permanent white population is small, including only a few hunters and trappers who spend the winters in the vicinity of the springs and Grand Lake. The Indians still claim the Park, and are jealous of all attempts of the pale faces to make permanent settlements.

W. O. C.

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### Improved Gas Burner.

Having ourselves experimented with one of these gas burners, we are in a position to speak from knowledge of its merits. We regard it as one of the best, if not the best ever employed for burning gas. Professor Henry Wurtz, editor of the *American Gas Light Journal*, states that "on the evening of June 13, 1870, in the photometric room of the Metropolitan Gas Light Co., at their 42d street station, in company with Mr. Dietrich, the engineer of said company, he made comparative tests of burners of Mr. Cremin's pattern in comparison with an ordinary three feet fish tail. The general result was that, the pressure being one inch, and the consumption of gas being 3½ feet per hour, the ordinary burner indicated an illuminating power equal to seven candles, while the Champion Gas Burner of Mr. Cremin went up as high as 11·5 candles; thus indicating, according to the experiment, a clear gain, by the employment of his peculiar principle, of over sixty-four per cent of the light from the same materials."

This testimony, from one of the most reliable authorities on gas lighting in this country, is sufficient to establish the reputation of this burner, which is, we are told, being rapidly adopted by such as are cognizant of its economy and value.

Our engravings give a view of the flame of a five feet burner, full size, and drawn, as it actually appeared, by our artist, and also a section showing the construction of the burner.

The general principle is the heating of the gas before it is delivered to the air for burning, whereby the gas is expanded, and a higher illuminating power secured with a given flow as measured by the meter.

In the engraving, Fig 2, A is the burner proper, from which descends a tube, B, into a tube or cup, C. This cup is closed by a diaphragm passing across it just above the screw thread, at F, by which it is attached to the delivery pipe. Small holes perforated in the part, F, allow the gas to flow out into the annular space between the cup and the outer shell, D, and its flow, indicated by arrows, is thence upward within the outer shell, down into the cup, and up to the burner proper through the tube, B. The tube, B, conducts heat downward into the shell and thus the gas is heated and expanded before reaching the point of combustion at A.

The invention was patented January 11, 1870, by Joseph W. Cremin, whom, for territorial rights or other purposes, address at 213 East 51st street, New York.

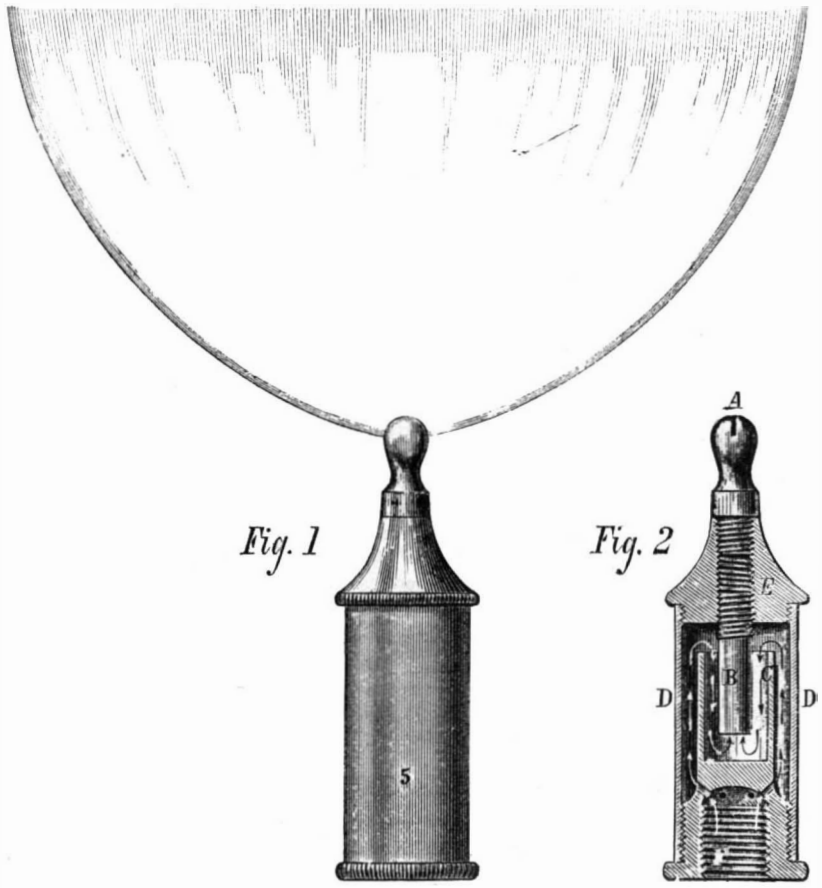



Fig. 1 Fig. 2

CREMIN'S GAS BURNER.

### Cloth Measuring Machine.

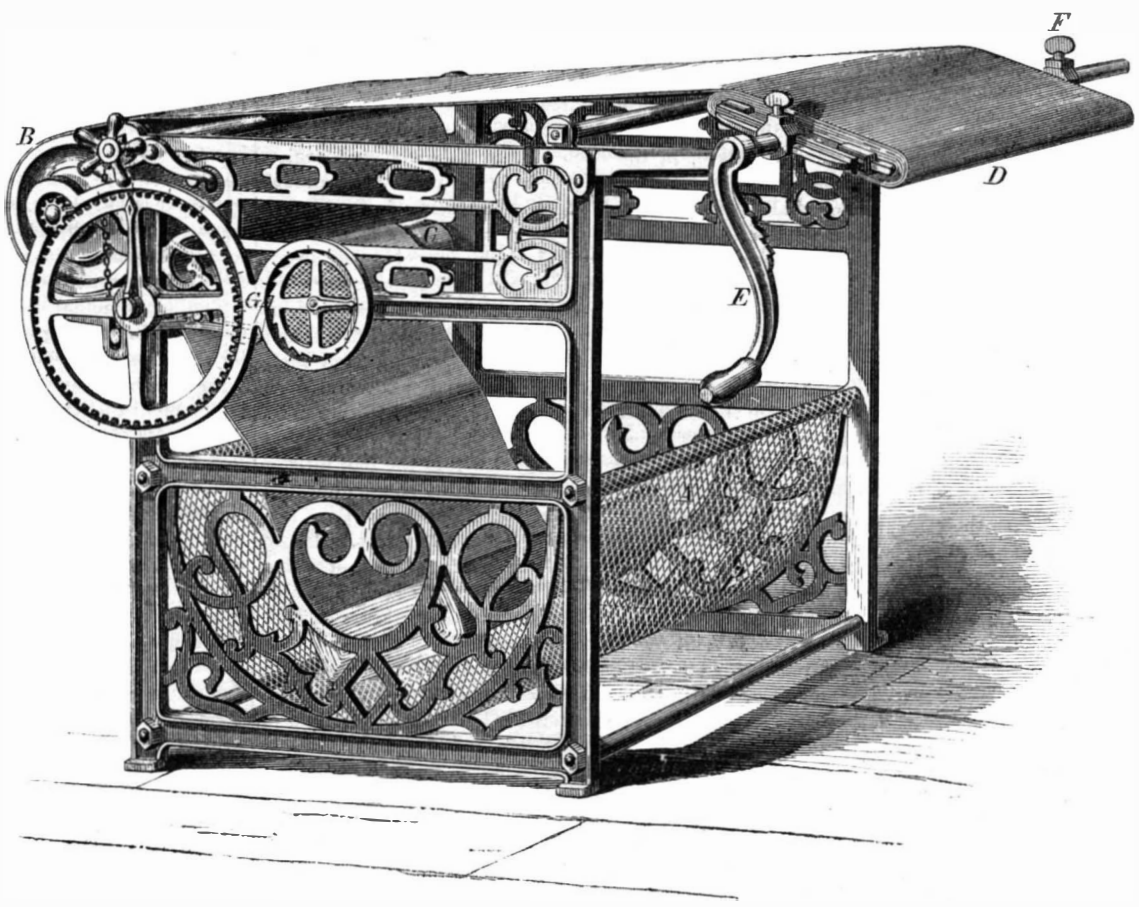
The measuring of cloth by the ordinary method is a tedious and laborious operation. The machine herewith illustrated is designed to replace manual labor and to render cloth measuring very much more rapid than has heretofore been the case. The invention is extremely simple, insures accuracy, and indicates correctly the quantity, while it may be operated readily by a boy.

The construction is as follows:

A is a hollow receptacle for the unmeasured goods; B is a measuring roller covered with cloth; C is a tension roller directly under the measuring roller. The cloth is passed between these two rollers and around the measuring roller, and then connected with the reel board, D, which is turned by the crank, E. The goods on the reel board, D, are quickly disengaged from the same by turning the screws, F, half round. The dials, G, indicate the exact measurement.

The machine will, it is claimed, unroll, measure, re-roll and correctly count every yard and fractional part of a yard with rapidity and exactness, fifty-two yards having been passed through the machine in one minute and a half, to do which, in the ordinary way, would require the work of six or eight men.

Patented June 25, 1871, by Isaac Miller, whom address for further information as to rights or machines, Hamilton, Ontario




MILLER'S CLOTH MEASURING MACHINE

### The Science of War.

Captain Layman, Instructor in Tactics at the German Military School at Cassel, in a series of lectures before the students of that Institute, attributes the victories of the German armies to the efforts which their commanders use to secure the offensive in war, and to keep the initiative of movements constantly in their own hands. This view is sustained by the results of the late Franco-Prussian war. The moral force of attack is thus utilized and brought out to the highest degree. This force is intensified with every successful exertion of it, while the consciousness of being on the defensive has a correspondingly depressing effect upon the opposite party.

### Microscopic Observation of Hydrofluoric Acid on Glass.

When the acid was first dropped upon the glass, no action was evident, the appearance presented being simply that of a drop of water on glass. In a very short time, however, the drop became a little duller, but this almost immediately cleared away, and several small particles, seemingly of glass, were seen floating in the drop. These seemed to be undergoing a process of fusion, the appearance being similar to that seen when a small portion of metal is thrown into some of the same substance in a state of fusion—it is tossed about for some time and then finally disappears. This was what evidently appeared to me to be going on here, the hydrofluoric acid having apparently a solvent action on the glass. What strengthened this opinion was the presence of magnificent colors, changing every moment as these small portions of glass were liberated from the larger piece and were undergoing the process of solution, thus leading one to suppose they consisted of small glass prisms, the colors being more perfect than those obtained by water prisms simply. Some of these particles were completely surrounded by a halo of color, as if they had been thrown into a variegated solution. The principal color evident in such cases was a deep green but dark blue was also seen at rare intervals. The foregoing observations were repeated several times, and always with the same results, with the exception that the small particles of glass floating in the drop of acid exploded now and then, causing a great commotion in the liquid and throwing up little jets of finely divided acid, behaving as if the small glass particles were hollow spheres. I may also mention that when these explosions occurred, bright flashes of light were visible, resembling closely the appearance of rainbows seen in waterfalls.—*Microscopical Journal.*

### Japan.

We are indebted to an esteemed correspondent for a copy of the Japan *Herald*, of December 9, 1871, printed at Yokohama, one of the treaty ports and a large commercial center. We find a number of curious items relating to Japanese affairs, of some of which we will give the substance:

The Government has taken possession of some extensive tea houses at Yedo, and converted them into a grand hotel for the accommodation of the princes of the empire, that once great and powerful class known as Damios. The hotel charges are as follows: First class guests per *diem*, lodging and three meals, 11 nomies, or 18¾ cents.

Six hundred houses were recently burned at Yedo, all of which had been erected on the district swept by the great conflagration of 1870. The latter burned over a district of five square miles.

Extensive gas works for the supply of Yokohama are now in process of erection. The company is of native formation, capital $150,000. The apparatus is supplied by Laidlaw & Son, Glasgow, Scotland.

The nursery gardens in the vicinity of Yedo are gay with blooming chrysanthemums which are cultivated with assiduous care. The Japanese, not content with potting and sticking them, support the large blooms in many instances by circular pieces of thin wood or cardboard, and, placing them under paper lighted conservatories, artistically dispose the plants in such a way as to represent men, women, and scenes in real life—effigies in various striking attitudes being completely covered with the growing blooms and foliage of these plants. Every year an illustrated sheet is issued by the Yedo nurserymen, showing the designs that have been adopted, there being a different one for each garden.

The Japanese Government, with the object of pushing on the civilization of the country and bringing it to as high a pitch in as brief a time as possible, are continuously engaging foreigners from abroad to enter their service. Without mentioning the American citizens who will presently arrive to fill various capacities, twenty-three French military instructors for the imperial army are engaged, and ten English instructors for the Japanese navy. Further, twelve beer brewers from Bavaria have been ordered, and a number of shoemakers (country unknown) will shortly arrive to teach the craft and mystery of boot making.

### Building Blocks.

This invention relates to a new manner of forming brick for practical building purposes; and has for its object to facilitate their transportation and handling, and to increase the strength of walls erected from the same. The invention consists principally in forming blocks from a number of bricks, within molds or boxes, in such a fashion that they (the blocks) will form sections of walls with interlocking joints. For certain purposes—as, for example, in the formation of pillars, etc.—the blocks may be made without interlocking projections. Another advantage of thus forming the blocks preparatory to building is that ornamental bricks may be baked on the blocks by subjecting the same to heat.

This will permit the application of all—even the most artistic—kinds of ornaments to the faces of brick structures Blocks thus formed, with or without ornaments, can, in building, be placed so as to project one beyond the face of another, thus relieving the tiresome monotony of the modern plain brick building fronts.

The inventor of this improvement is Mr. Andrew Derrom, of Paterson. N. J.

DISPATCHES from Teheran state that the famine in Persia is unabated. Many persons are dying daily,

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# Scientific American.

**MUNN & CO., Editors and Proprietors.**

PUBLISHED WEEKLY AT

**NO. 37 PARK ROW (PARK BUILDING) NEW YORK.**

O. D. MUNN. A. E. BEACH.

☞ "The American News Co.," Agents, 121 Nassau street, New York.

☞ "The New York News Co.," 8 Spruce street, New York.

☞ A. Asher & Co., 20 Unter den Linden, Berlin, Prussia, are Agents for the German States.

☞ Messrs. Sampson Low, Son & Marston, Crown Building, 185 Fleet street, Trubner & Co., 60 Paternoster Row, and Gordon & Gotch, 121 Holborn Hill, London, are the Agents to receive European subscriptions. Orders sent to them will be promptly attended to.

VOL. XXVI., No. 10. [NEW SERIES.] *Twenty-seventh Year.*

NEW YORK, SATURDAY, MARCH 2, 1872.


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## PUBLICATION OF THE PATENTS.

Our readers will remember that the publication of the diagrams and abstracts of the patents, in the annual Patent Office reports, was discontinued by Congress some three years ago, much to the dissatisfaction and inconvenience of a large portion of the public. But there was good reason for the discontinuance. The printing entailed an immense cost upon the government, while large quantities of the books, given over as they were to members of Congress for free distribution, were thrown away and wasted, or gathered into the cellars of wrapping paper dealers.

After the discontinuance of the reports, the Commissioner of Patents began the weekly publication of the patent claims in a special pamphlet, which has proved of much value, and is in a measure a substitute for the annual reports. This weekly pamphlet has lately been styled the *Official Gazette*, and it is furnished to regular subscribers at $5 a year. To make the *Gazette* still more complete, the Commissioner of Patents now proposes to publish in it, weekly, the drawings, with abstracts, of all patents issued. For the information of members of Congress and to illustrate the proposed method of publication, the Commissioner has caused to be issued one number of the *Gazette* with abstracts of the specifications, claims, and drawings of the patents for one week, the drawings being photo-lithographed on a reduced scale. This number is now before us, and it is altogether the most concise, economical, practicable and valuable form of patent publication that has yet been produced at Washington. It reflects the highest credit upon the Commissioner of Patents, and we trust that Congress will promptly grant the necessary authority and means for its continued and regular issue.

The present number of the *Gazette* presents the abstracts, claims and drawings of 205 new patents, and they occupy 26 pages. All the drawings are perfectly clear, and yet so compact is the printing that a single volume of 1,600 pages would suffice to contain the drawings and abridgments of all the patents for an entire year, or about thirteen thousand in number. The last complete Patent Office report, that of 1868, consisted of four volumes, comprising over 3,500 pages, and in it were illustrated not quite thirteen thousand patents. To be sure, the pages were a little smaller than those of the *Gazette;* but the economy of space, of paper, and consequently of expense, is considerably in favor of Commissioner Leggett's present plan of printing.

We earnestly hope that Congress will authorize the proposed publication. Nothing contributes more directly to the growth and prosperity of our varied industries than the general circulation of intelligent descriptions and drawings of the latest improvements. All our artisans are interested in them; they stimulate thought, they encourage industrial progress.

Having thus signified our approval of the Commissioner's project, for we regard it as a step in the right direction, we will now suggest, to him and to Congress, some reasons for advancing a little further. Instead of giving only abstracts of the specifications, we ask the Government to *print the specifications in full.*

The Commissioner shows us, in his specimen, how readily the drawings may be reduced and printed, and how compactly the abstracts may be presented. We ask him now to compact the publication a little more, and print the specifications and drawings in full every week, thus placing them conveniently before the public.

The chief defect of our present patent system consists in its lack of provision for the full publication of existing patents *in a condensed, cheap and popular form, so that everybody may possess them.* This once accomplished, patents may be granted to every applicant, and the present cumbersome and defective system of Patent Office examinations, with all its delays, expenses, injustices, and unnecessary prosecutions, may be discarded. Instead of a small corps of official examiners, we should then have twenty thousand examiners, every applicant for a patent being his own examiner.

In no country in the world is there so much patent litigation, or so much time and money wasted in procuring, defending, and wrangling about patents as in the United States. The value and validity of a patent rests upon the clearness of its statements and its priority over other patents. But when these other patents are unknown or difficult of access by the people, as are our patents, quarrels and confusion are the natural result.

It may be laid down as an axiom in regard to patents that, where the full specifications and drawings are easily accessible to the public, there will be little or no patent litigation.

In England, the drawings and specifications of all patents are printed in full and are, to a considerable extent, accessible to the public. The practical result is that England is almost exempt from patent litigation, although patents are granted to almost every person who chooses to file an application.

The evidence recently presented to Parliament shows that in all England the average number of patent cases in which proceedings are commenced before the courts is *only eighteen cases per annum!*

To say nothing of our courts, there is more trouble and litigation over patent cases before our Patent Office in one month, than there is in all the courts of England in an entire year! It is true that five times as many patents are granted here; but the excess of American litigation is out of all proportion to the augmentation of patents. We apply the term litigation to all contested patent cases.

The remedy is simple. 1. *Print the patents in full, at the cheapest rates, so that everybody may possess them.* 2. Grant patents to every applicant who presents proper papers. 3. Dispense with models, official examinations, rejections, appeals to Boards of Examiners, appeals to the Commissioner, appeals to the District courts, and all the other cumbersome machinery of the Patent Office which now burdens the inventor with expense and annoyance.

## CONGRESS AND PATENT EXTENSION CASES.

As will be gathered from the letter of our special correspondent at Washington, published in another column, there is at the present time an unusual number of applications before the Committees on Patents in Congress for extensions of patents. The success of a few of the applicants, and the apparent facility with which those presented are reported upon by the Committees and passed by Congress, is giving encouragement to those disappointed in their efforts to obtain extensions before the Patent Office, and so increases the demands upon Congress for special legislation as to threaten to become a serious evil.

It has always been our opinion that Congress ought not to meddle with these cases, an opinion to which we have given the most clear and emphatic expression in these columns. We have never seen cause to change our views upon this subject, and we now repeat that the only proper action on the part of the National Legislature in regard to such applications is to authorize the Commissioner to take cognizance of and act upon applications which for valid reasons have not been presented during the time fixed by our patent laws. An application that the Commissioner has refused should never receive the sanction of the Committee on Patents, nor the time of Congress be used in discussing such claims. In the first place, that body has not the requisite knowledge, or time to obtain knowledge, on which to act intelligently. Second, the presentation of such applications is like those of claims, a great opportunity to the lobby, who will either enforce inventors to entrust these camp vultures with the prosecution of applications, or strive to defeat any favorable action. It is well known that the merit of a claim is seldom what passes it. We were once, when pressing the merits of a claim upon the mind of a distinguished member of the third house, interrupted by the bluff assurance that "bless your innocence, the merits make no manner of difference. Claims don't go through on their merits; but they do go through, and if you can spend money enough yours will go through, and not without." We would not spend money enough in this way, so our claim still stands unsatisfied.

It will not be long, if this sort of patent extension legislation continues, before it will become a matter of lobbying altogether, and it is not much better than that now. Occasionally the maladroitness of some blunderer gives the public a peep into the mysteries of lobbying. Some of our readers—not the oldest by any means—will recollect how one of these "too smart" manipulators, who pressed an application for the third extension of one of the most valuable patents ever granted, invited the lawgivers with their wives to a feast, and how beside each gentleman's plate was placed a handsome revolver mounted in the richest style, enveloped in a handsome case, and how beside each lady's plate was a box of the finest kids, and how, the fact being published abroad by the watch dogs of the press, the storm of protest thus evoked, through the lobby man's overdoing, made that gentleman's anticipated cake turn out the most underdone kind of dough. This thing was not done in a corner; that is probably the reason why it failed so signally in its desired effect, but it indicates the existence of the probabilities referred to. Skillful lobbyists understand more thoroughly the value of corners, both literal and figurative, than did the bungler who afforded the public an insight into the way things may be accomplished by demonstrating how not to do them.

The kind of action which we consider legitimate, namely, the authorization of the Commissioner to act on applications after the legal time has expired, may be exercised with justice and equity, and it gives less rise to jobbery; but the reasons for such exceptions should be good, and if, as in some cases, the fault rests with the party, who has omitted, through simple carelessness, to apply, within the period limited by law, to the Patent Office tribunal for his extension then we contend the applicant has no right to the attention of Congress to remedy his own heedlessness. The passing of an act to extend a patent, after the application has been refused by the Commissioner on grounds deemed valid and derived from thorough investigation, seems an insult to the intelligence of that officer, and is a kind of special legislation which must inevitably lead to corruption and foster monopolies. We see no reason why Congress should not as soon give a patent to a man who has been refused a grant on an original application as to extend a patent to one who has not only enjoyed all the privileges pertaining to his original patent, but has in the opinion of the Commissioner, who has the opportunity to know, reaped an adequate, or more than an adequate, reward for his invention and the labor and expense of introducing it to the public. But this is not the worst of patent legislation; after an extension of seven years by the Patent Office, making the monopoly enjoyed by the patentee 21 years—the limit allowed under the patent law—the patentee, or more usually the manufacturer monopolist in the name of the patentee, goes to Congress and asks a further extension for the poor inventor! Not because he has not been amply rewarded, but because he has made so much out of the invention as to enable him to afford the large expense necessary to enforce his claim. Those persistent applicants are the ones most likely to succeed before Congress, and it is against legislation in such cases that we most specially protest. Instead of encouraging and fostering inventions and manufactures, such legislation discourages the poorer inventors and brings into disrepute our patent system.

## DRYING SUBSTANCES BY STEAM.

There are three physical states in which water may exist above the temperature of 32° Fahr.: first, as liquid; second, as saturated steam; third, as superheated steam. When the word "steam" is used alone, saturated steam is what is meant. Saturated steam always contains, as we have shown in previous articles, a specific number of units of heat in each unit of weight, no matter of what temperature or pressure. Steam generated where heat is applied only to the water from which the steam is made is always saturated, because no heat can pass into the water without converting a portion into steam. When we speak, then, of saturated steam, or simply *steam*, it is to be understood that such steam as contains the normal amount of water specific to steam generated from water under ordinary atmospheric pressure is meant. The weight of saturated steam corresponding to a given number of heat units is always the same for any pressure or temperature at which steam can be generated. This, of course, follows from the law previously stated, and therefore requires further no remark.

Superheated steam, on the contrary, is produced by applying heat to the steam while it is isolated from water, either by a *septum* of saturated steam, or by walls of metal or other suitable material. Superheated steam may contain more or less heat in proportion to its weight. It differs, therefore, from saturated steam in that its quantity of heat is not specific to its weight. These distinctions are important to the clear understanding of what is to follow.

Substances may be dried either by saturated steam or by superheated steam, and either the one or the other may be employed in one of two different ways, the principles of which differ.

First, the steam or superheated steam may be used in a confined state, as in racks of pipe, steam cylinders, etc. In this way, the heat is transmitted by the steam through the material, that surrounds it to the substance to be dried, the moisture in which, being thus transformed into vapor, passes off into the surrounding atmosphere. To successfully dry substances in this way, two points must be observed, namely, the water which accumulates in the heater must be constantly removed, and the air, which absorbs the vapor from the drying material, must be changed so often as not to become saturated. Free circulation of air in drying rooms heated by enclosed steam is therefore an absolute essential to success, and it should be secured even if necessary to use fans for the purpose. Cold dry air will dry substances faster than hot air saturated with watery vapor.

There are many substances, such as cotton or woolen yarn, white lead, sand, etc., that, having a great attraction for water, will not dry rapidly when confined steam at 212° Fahr. is employed. At this temperature, there is slow evaporation from the surface. The water converted into steam is condensed and held by action of capillary attraction at the surface. The water is thus slowly forced from the interior outward, and so on until the substance is at last sufficiently dried When drying is performed solely by heat externally applied, it will proceed almost as well at 90° as at 210°, provided a good circulation of air is maintained. The air cannot take up the water faster than the capillary attraction will convey it from within to the surface, and as up to a temperature of 212° this action is in no way aided by the expansive force of steam generated at higher temperatures in the interior, a

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great deal of heat may be wasted by carrying a temperature, higher than necessary to maintain surface evaporation, yet too low to produce evaporation from the interior.

When a higher temperature, say that corresponding to 45 lbs. pressure or 292° Fahr. is maintained, a very different action takes place. The water in the substance to be dried is then converted into steam of sufficient tension to not only overcome adhesive attraction, but to expand and force its way out and to float away as steam does from the exhaust of a steam engine. This accounts for the fact stated by a recent correspondent, published in answers to queries, to wit.: that in drying woolen yarn, he finds it necessary to carry forty-five pounds pressure of steam in his drying cylinder. As soon as the temperature corresponding to this pressure is reached, the yarn dries rapidly, while at all lower temperatures the drying is a tedious process.

So much for drying by steam inclosed in pipes. The direct admission of saturated steam into the interstices between solid bodies, which are not only to be dried but heated, has been found in practice to answer admirably in some cases. In this method of using steam, it is received in closed retorts containing the substance to be dried and heated. The steam immediately heats the material, and in doing so becomes condensed. The water of condensation is drawn off, as it forms. The solid bodies attain the temperature of the steam with great rapidity. As soon as this is the case, the following conditions exist in the retort: The bodies are hot and their surfaces are dripping wet with the water of condensation. Now, if they have a temperature sufficiently high, and are sufficiently large, the heat they contain will evaporate all the water upon their surfaces, and still leave the bodies at a temperature of 212° Fahr. or higher, whenever the flow of steam from the boiler is cut off, and the retort is opened or allowed to exhaust into a second retort containg another charge of cold material. This method has been employed with great success for heating broken stone for paving purposes, gravel for roofing, etc. The reader will find full description of a patented invention of this kind on page 305, last volume of the SCIENTIFIC AMERICAN.

Water may be extracted from solutions by the direct injection of superheated steam. Every pound of superheated steam will convert such an amount of water at 212° into saturated steam as corresponds to the excess of heat in the superheated steam over that of one pound of saturated steam. In doing this, it becomes reduced to saturated steam and passes off as such without condensation, carrying with it 967 units of latent heat. Therefore this method of drying or concentrating solutions must be exceedingly wasteful unless the heat in the saturated steam can be subsequently used. It may, however, be employed advantageously in some processes where it is an object to maintain a constant temperature, and in which economy is of secondary importance.

## AMERICAN HOMESTEADS.

There is a peculiar charm about old houses, which is seldom felt in America. In Europe, one finds everywhere quaint old buildings, in which generation after generation have been born and reared, and have married and died. Every nook and corner of the building is clustered over with memories and associations. The change of such a mansion from the possession of one family into that of another is regarded as a humiliation, and mourned as disaster. This feeling is not without a salutary moral effect. It cultivates a family pride, a feeling of honor in the family name, which, handed down from father to son, is sought to be maintained through successive generations. It begets a sentiment of unity, among those who bear the same name and are connected by ties of blood, which strengthens these ties, and tends more or less to make each regardful of the interests of all.

But here in America there are, as a rule, no old houses. The son tears down what the father built, or passes it into other hands with little or no regret or compunction. He builds again that which his sons shall raze or sell, regarding merely his own convenience, and careless who shall dwell in the spot he inhabits after he has quitted it forever. Almost all our building is for the present. We erect with a view to tearing down, not for permanence, and hence it is that our architecture has an unsatisfactory air of instability, of cheapness, and temporary expediency, which offends cultivated taste, and goes far to justify the assertion that American architecture as an art is scarcely to be met with in our homes.

It is true there are some fine and costly residences, scattered about through the country and grouped in our large cities, but throughout the land, cheap frame buildings, with scarcely an appearance of design, offend the eye by uncouth forms, shapeless sculpture, and glaring white or dingy mud colored exteriors. Though we do not dwell in tents, like some of the Tartar tribes, we are essentially nomadic in our habits and tastes. Boys escape as soon as possible from unattractive homes, to chance their luck in cities, or hew out fortunes on frontiers. Young men clear off farms in the far west, sell them at the first apparently good offer and try it over again. Land, with us, is not a thing to be kept if possible, but to be speculated in. Cultivation of soil is too often only the temporary improvement preparatory to sale.

Thus increases and flourishes that restless, wandering spirit which characterizes the true Yankee born American. Considerations of love for the spot, on which one has been born and bred, are feeble when placed against hopes of profit. All this may, perhaps, find some compensation in the enterprising spirit it engenders; but it does not make our rural homes picturesque piles half hidden by honeysuckle, ivy, and woodbine, like the garden embowered farm houses and cottages of England.

Much has been written with a view to improve our architectural taste as a nation, but we are yet too young to progress rapidly in this respect. The greater portion of our land is too cheap. We have too much elbow room, and we are too fond of change. We do not wish to spend much money on what we may, in a few years at furthest, cease to occupy. So we go on the cheap principle in building, and content ourselves with mere bodily comfort, sacrificing æsthetic considerations to utility. It is vain, therefore, to expect any great general improvement in architecture until we shall have advanced beyond adolescence as a nation. When the great West shall have absorbed all it will hold of the world's population, and people look to die where they are born, homesteads will be beautified, and a sense of what is meant by the word home will be so impressed, upon the minds and hearts of youths, that to adorn the place of nativity will seem almost a duty.

## THE STUPIDITY OF IGNORANCE.

Some three years ago, the Commissioners of the Central Park, New York, at the instance of some of our leading scientific men, undertook to establish a palæozoic museum, where the pupils of the public schools and those interested in the study of natural history might find specimens of the earliest animal creations, now extinct, and acquire useful knowledge of their forms and habits. For this purpose Mr. B. Waterhouse Hawkins, one of the most learned and talented of professional men, was empowered to construct the restorations, and upon them he labored as assiduously as means were provided for nearly two years, when a political change took place, by which a new set of Commissioners came into power. These men were under the control of an Irish politician, the head of the notorious gang known as the Ring, by whom the city treasury was plundered of so many millions.

One of the first acts of these blundering and ignorant Commissioners was to annul the contract made with Mr. Hawkins, and arrest his work. He recently stated that all he had done during twenty-one months to restore the skeletons of the extinct animals of America (of the Hadrosaurus, and the other gigantic animal, which was thirty-nine feet long), was destroyed by order of Mr. Henry Hilton, late vice president of the Commission, on the 3d of May last, with sledge hammer, carted away and buried. The preparatory sketches of other animals, including a mammoth and a mastodon, and the molds and sketch models were also destroyed. Mr. Hilton did this, said Mr. Hawkins, out of ignorance, just as he had a coat of white paint put on the skeleton of a whale which Mr. Peter Cooper had presented to the Museum, and just as he had a bronze statue painted white. Mr. Hilton told the celebrated naturalist, who had come from England to undertake the work, that he should not bother himself with "dead animals," that there was plenty to do among the living. This illustrates the policy of having such ignorant men as Hilton at the head of one of the most important departments of the city government. A new and more intelligent set of Commissioners having recently come into power, the skeletons were dug up again, but they were found broken in thousands of pieces. Professor Henry, of the Smithsonian Institute, when he heard of this piece of barbarism, would not believe it. "Why," he exclaimed, "I would have paid them a good price for the work." Mr. Hilton, however, preferred to destroy the work of the naturalist, which has cost the city at least $12,000.

## THE POSITIVE MOTION LOOM GRAND MEDAL OF HONOR.

This exceptional prize of the American Institute, awarded only to inventions of such great importance as to promise a revolution in the industries to which they are applied, was, as our readers are aware, awarded to Mr. James Lyall for his Positive Motion Loom, on its first exhibition at the annual fair held by the Institute. After some delay, the medal has been struck, and is now in the possession of Mr. Lyall. It is of gold, large and handsome; and is mounted in a beautiful case. It is a just recognition of a masterpiece of ingenuity. The loom was shown again at the last year's exhibition with very marked improvements, which, according to unanimous opinion, have greatly increased its utility. All the predictions made by us in our description of this invention, page 17, Vol. XXI, have been fully verified, and although the proprietors have had to contend with a disastrous fire, they are meeting with the most gratifying success in the introduction of their looms. The invention has been applied with remarkable advantage in the weaving of corsets and the manufacture of wire cloth, as well as oil cloth foundation, druggets, etc., and several new and large manufactories have been put into operation, employing the positive motion loom in the industries named. The inventor, Mr, James Lyall, is one of those men whose characteristic modesty and other good qualities secure the heartiest goodwill from all who know him, and a choice party of these friendly well wishers honored the occasion of the presentation of the medal, on the evening of February 22, at his residence in this city.

GLYCERIN CEMENT.—A cement, said to be capable of use where resistance to the action of both water and heat is required, is composed by mixing ordinary glycerin with dry litharge, so as to constitute a tough paste. For uniting the joints of steam pipes and other similar applications, this preparation is said to be very satisfactory.

MR. J. F. MCCURDY writes to us to suggest that grindstones are often burst by the strain on the center caused by the shaft, and that centrifugal force is not the sole cause of such accidents.

## SCIENTIFIC AND PRACTICAL INFORMATION.

### GUN COTTON.

In our number of September 3, 1871, we described the apparent dangers and difficulties of the manufacture of gun cotton; and we are now in possession of a report of a commission of enquiry, appointed by the British Secretary of State for War, which gives some information which will interest many of our readers. The committee decided that compressed gun cotton is not uncertain or perilous in use; and, as an explosive, it is effective, certain, safe, and portable. The paper pulp gun cotton of Mr. Abel's invention is capable, says the report, of being more thoroughly purified than the ordinary cotton in cords or skeins, and moreover is, from being prepared in a wet state, uninflammable up to the time of its leaving the press. The drying is alone the dangerous part of its manufacture.

### SULPHURETTED ALCOHOL.

Professor Gamgee informs as of a new concentrated disinfectant, obtained by impregnating alcohol with sulphurous acid, of which gas it is capable of containing no less than three hundred times its own volume. The portability and convenience of such a fluid will be obvious to every one; its general use as a disinfectant will be probably somewhat qualified by the nauseous smell. But for the destruction of insects and as a substitute for fumigation with burning sulphur, it has the recommendation of apparent efficiency.

### SUBSTITUTES FOR GUNPOWDER.

The exigencies of the people and authorities during the protracted siege of Paris called out many improvements and substitutes for articles in common use. M. Deplazanet, of Grenelle (a suburb of Paris, within the besiegers' lines), produced a powder in which chlorate of potash was used instead of saltpeter (nitrate of potash). This preparation answered well for torpedoes and mining purposes, but it proved to be so destructive to metal as to be unfit for use in small arms and artillery. It was composed of 2 parts chlorate of potash, 1 part of prussiate of potash, and 1 part of powdered sugar. These ingredients are known to be very dangerous when combined, and it is not to be wondered at that the factory of M. Deplazanet was destroyed by an explosion, which catastrophe put an end to the manufacture.

### ELECTRICAL EXPLODERS.

Mr. Clemens Herschel, of Boston, Mass., writes to call public attention to the dangerous implement called an electrical exploder, used for igniting blasting charges, etc., by electricity. It is said to be so sensitive that dusting near it with a feather duster produces sufficient electricity to discharge it, and the use of a rubber comb may occasion a similar accident. He suggests that such contrivances, useful enough in their proper places, should be so constructed that the spark of a battery would be needed to discharge them. There is reason in the suggestion, as a battery is always used for the purpose.

### STACKING LUMBER.

The news of a distressing accident in which some little children were crushed by falling lumber, in Newcastle on Tyne, England, warrants us in calling attention to the dangers of our lumber yards and the insecure manner in which high piles of timber and boards are stacked. In many of our cities, it is common to see stacks of great weight piled together without due regard to safety, giving the next high wind an opportunity of toppling them to the ground. Children are apt to seek lumber yards to play, and we would warn our lumber merchants to guard against such an accident as has recently occurred in England.

### New Invention.

The Girard *Cosmopolite* says that, at a certain station on the Philadelphia and Erie Railroad, the company has a new night telegraph operator, who, if inclined to slumber, is too ingeniously wide awake to be canght napping at his post. Recently he was seized with drowsiness which he could not shake off. As it was his duty to report all passing, he dared not yield, and yet could not resist. That mother of invention, necessity, at length suggested an alarm signal, which he proceeded to put in operation by suspending a scuttle full of coal, by means of a cord which was passed through the keyhole of his office door and fastened across the track at the requisite elevation. Mr. Operator then resigned himself to rosy dreams, which were finally interrupted by a passing train, the engine of which snapped the cord, causing the coal scuttle to come down with a rattle-te-bang that would have aroused even a sleeping Erie policeman. Another young operator, some thirty miles up the road, let a train slip by him the same night, and applied to the inventor of the coal scuttle alarm to know, when the train passed his station. No answer was vouchsafed, the inventor remarking "Why don't the darned fool get the right to use my patent?"

THE *Lens* is the title of a new quarterly magazine, of microscopy and its allied natural sciences, published by the State Microscopical Society of Illinois, at Chicago: S. A. Briggs, editor. The first number is before us. It is illustrated with a variety of diagrams of monads, and contains a large amount of useful matter, rather technological in character, but of value to the trained microscopist. The *Lens* promises to be a valuable addition to the scientific periodical literature of our country. We trust that it will be well sustained.

HUMILITY is the lesson of science. It is by measuring ourselves against the unsolved mysteries of science that we learn our feebleness.

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[Special Correspondence of the Scientific American.]

## EXTENSION CASES BEFORE CONGRESS.

WASHINGTON, D. C. February 20, 1872.

Under the new Patent Act, passed July 8, 1870, power is vested in the Commissioner to extend any patent granted prior to March 2, 1861, for the term of seven years from the expiration of the original term, but no patent granted since the above date can be extended. The Commissioner, however, has no power to renew a patent after it has once expired, neither is provision made for an appeal from his decision in extension cases. Hence, disappointed applicants in these cases have occasionally carried them before Congress under the form of petitions for relief, and as that body has shown a disposition to give them a favorable consideration, the number of applicants has of late increased. The present Congress has received many applications of this class, of which the following is a list, the first one mentioned being one of the most important and meritorious, as will appear from the following brief statement:

The case is that of A. Smith and H. Skinner, of Yonkers, N. Y., for an extension of their patent of November 4, 1856, for a carpet weaving loom. The object of the invention is to produce by machinery an Axminster or tufted carpet, a fabric of which the distinctive features in the manufacture, namely, the insertion and binding of the tufts, had heretofore depended on hand skill, a weaver working only two yards a day. With this loom, the devices of which are necessarily very complex yet very admirable as specimens of mechanical action and effect, the manufacturer can produce from seventeen to twenty yards per day. Owing to losses by fire, and the delays incident to the perfecting of some parts of the mechanism, it was not until the fall of 1868 that the inventors put their carpet on the market. The article was so well received that the company erected a large factory, and in 1870 had thirty looms in operation. A. T. Stewart & Co. early became dealers in this important article of American manufacture. The application for extension was refused by Commissioner Fisher, on the ground that the English patent issued to the inventors before the American patent had expired, in accordance with section 25, of the Patent Law of 1870, which provides that domestic patents, issued upon inventions previously patented abroad, shall expire with the foreign patents. As this decision of Commissioner Fisher has not been sustained in subsequent cases of this nature, there will be no hesitation on the part of Congress in granting the petition of Messrs. Smith & Skinner; and it should be stated in this connection that Mr. Fisher considered that the facts and considerations of the case favored the granting of an extension, while at the same time, his understanding of the section of the new law, above referred to, imposed on him the unpleasant duty of refusing the application of the patentees.

No opposition to the above extension has been filed.

The application of A. B. Wilson, now before Congress, is exciting special interest, as very large moneyed interests are involved, and the opposition is necessarily strong, and is rendered more determined from the fact that the patentee has already received the benefit on one extension term, which has proved immensely lucrative. The patent was for an improved sewing machine, was issued November 12, 1850, and was extended in 1864 for the authorized time of seven years, which expires November 12, 1871. Its value is apparent when it is considered that it covers all the four motion feed mechanisms in use. The invention included other devices, but the feed motion was its valuable feature, and consisted of a box vibrating upon the machine table, the other side of the box having serrations like a shoemaker's rasp. The cloth was laid upon these projections, and being pressed on them by a spring was carried forward by the teeth at each movement of the bar. This was called the rough surface two motion feed, and as no points penetrated the cloth, as was the case in the continuous feed of Batchelder, patented in 1849, it could be turned so as to sew seams of any desired curvature. In 1852, this feed was improved by giving to the bar a motion forward, to carry the cloth to the needle, a motion downward to release the cloth, a motion backward and a motion upward to take a fresh hold. This is what is known as the four motion feed, and is seen in most sewing machines. This application is opposed.

Petition of W. E. Ward for extension of his patent for a nut making machine, issued October 7, 1856, and reissued January 1, 1867. The patentee's application to the office for an extension was refused by Commissioner Fisher for the same reason that decided his action in the case of Smith & Skinner above referred to, namely, that the letters patent obtained by applicant in England, in 1856, had already expired. The English patent was dated May 8, 1856, and therefore, expired five months in advance of the American patent. "If the extension now asked for be granted," says the Commissioner, in his decision, "it will be a continuation in this country of the monopoly for an invention, the foreign patent for which has expired." Previous to this invention a punch and die were used for both cutting off the blank and for compressing it, and another punch for forming the hole, and the blank or nut was swaged while yet on the punch by which it was pierced. In Ward's machine the blank, after having been cut from the bar by one punch and the central hole made in it by another, is transferred automatically to and placed upon an intermittingly revolving mandrel equal in diameter to the hole in the blank, and while in the mandrel is swaged upon the sides and edges by hammers operating automatically. The examiner, in his report, states that the invention was only in part novel, the punches and dies and their arrangement relative to one another being substantially shown in a French patent of 1826.

George W. Morse. Two patents for improvements in fire arms, both dated October 28, 1856, expired October 28, 1870. The applicant filed his petition in the office for an extension, in accordance with the rules, but the application was refused by Mr. Duncan, the Acting Commissioner, on the ground that the testimony given in the case to show that the inventor, though residing in the South during the late civil war, neither aided nor abetted the rebellion, was insufficient. Mr. Duncan, in his decision, says: "We should have a declaration, not of beliefs, but of actual facts. With these before us, a reliable judgment might be formed as to whether applicant carried himself free from all contamination with the rebellion, and whether circumstances were such as to justify him in absenting himself from that portion of the country where alone he would have been in position to urge his improvements upon the Government at the time when, if the inventions were of real value and importance, he might reasonably expect to secure their trial and introduction." The bill before Congress for the relief of Mr. Morse asks that the Commissioner be authorized to reconsider his case, in view of additional testimony to prove his loyalty. The bill has already passed the House, though not without some discussion. These inventions pertain to breech loading arms and metallic cartridges.

Ira Buckman, Jr. Patent for a walking stick gun, dated August 4, 1857, expired August 4, 1871. The inventor did not apply to the office for an extension, and now asks that the Commissioner be authorized to hear his application in the same manner as if it had been duly filed ninety days before the expiration of the patent.

William Sellers and Coleman Sellers. Patent for improved coupling, dated May 5, 1857, expired May 5, 1871.

The petition of the patentee is similar to that of Buckman just given. The device consists of two conical sleeves within one external sleeve, so arranged as to compress the ends of the coupled shafts separately, whether of the same or different diameters; also in the mode of bolting the conical sleeves, the bolts serving as keys to prevent the cones from turning.

Edward Hall and Joseph L. Hall, for improvements in fire proof safes, dated August 21, 1849. Extended by the Commissioner for the term of seven years from August 21, 1863. The surviving patentee, Mr. Edward Hall, petitions for a second extension, on the ground that, without neglect or fault on his part, he has failed to obtain a reasonable remuneration. By the terms of the Patent Law, the Commissioner is not authorized to grant a second extension in any case. The invention consists of a concrete safe, the interior and exterior covering being joined by bolts imbedded in hydraulic cement.

Frederick P. Dimpfel, for a steam boiler, dated July 16,1850, Extended by the Commissioner; the term expired July 16, 1871. This is an application to authorize the Commissioner to grant a second extensiou, after a due examination on the merits of the case. The invention relates to the construction of the water tubes and a means of forcing the circulation.

Horace L. Emery. Improvements in endless railway horse power, dated February 22, 1852, expired February 22, 1866. The case is similar to that of Buckman, mentioned above.

William Trapp. Machine for making casks, barrels, etc., dated October 1, 1845, extended by the Commissioner, the term of which extension terminated October 1, 1866. The petitioner asks for a direct extension from Congress.

C. P. S. Wardwell, for a circular sawing machine, dated March 10, 1857, and expired March 10, 1871. Petition to go before the Commissioner. The invention consists in an arrangement of two or more saws, in a swinging frame so that either may be brought into working position.

William Pierpont, for a straw and grain separator, dated May 7, 1850. Extended by the Commissioner. Petitions for second extension from May 7, 1871. The device is an elongated apron or pierced platform hung upon and worked by cranks in connection with the other parts of the threshing machine.

Alfred W. Gray. Improvement in links of endless horse powers, dated September 9, 1856, and expired September 9, 1870. Petitions to go before the Commissioner. The links are made of corrugated sheet metal, so that the corrugations shall serve both as hinges for connecting the links and as cogs for the gearing.

Thomas W. Harvey (deceased). A machine for threading screws, dated May 30, 1846, and extended by the Commissioner in 1860. The applicant, Mr. H. A. Harvey, petitions for a direct extension from Congress.

Edward P. Torrey and William B. Tilton. Improvement in torsional rod door springs. The application to the Commissioner of Patents was refused because Tilton had not joined as a party seeking the extension, it being alleged at the time that Tilton was believed to be dead. The Commissioner, in his decision, also strongly intimated that the patent sought to be extended ought not to have been granted originally, in view of the proofs adduced. Both inventors now come forward and pray that Congress grant the extension so refused by the Commissioner.

The following persons have also petitioned Congress for relief, namely: Chester C. Tolman, Stephen Hull, John B. Emerson, L. W. Pond, P. L. Wardwell, D. J. Powers, Calesta E. Cox, William Sellers, John C. Bickford, William C. Jardine, Elizabeth A. Jackson, William A. Graham, Samuel A. Knox, A. S. Macomber, John W. Nears, Fred. N. Norcross, and Levi Bissell.

The Private Acts and Resolutions of Congress in relief of patentees or their heirs are few in number, only twenty-four from 1860 to 1870, and nearly one half of these cases were passed in 1870. The great proportion of these cases arose out of the neglect of the parties to file their applications in the Patent Office within the prescribed time, namely, ninety days before the expiration of the patent, and the Acts simply authorize the Commissioner to consider the applications as if filed in accordance with the law. In some instances, not only months but years have passed between the expiration of the patent and the action of Congress, the invention in the meantime becoming public property. In such cases the public is protected by a proviso to the effect that all persons who shall have made use of the invention, during the interval referred to, shall be relieved from all liability for said use.

We find only two cases in which Congress has granted an extension independently of the Patent Office. The first occurred in 1867, on an application from the widow of Henry A. Wells for the extension of her husband's inventions in the manufacture of hat bodies. The patents were two, both dated April 25, 1846, and had been extended by the Commissioner in 1860. Several reissues had been granted from time to time, and the two most important of these were extended by Congress without condition.

The second case is that of John Batchelder's patent for sewing machine, dated May 8, 1849, and extended by the Commissioner in 1863. By Act of July 14, 1870, Congress granted an unconditional extension, to take effect from the expiration of the first extension, namely, May 8, 1870, adding the usual clause for protection of all persons who had purchased the machine after the expiration of the first extension term.

In 1866, a patent to Theodore Hyatt, for a vault cover, was directly extended by Congress, and in 1867 a patent to Thomas D. Burrall for a corn sheller, but in both these instances the applications were submitted to the Commissioner, he being directed to extend the patents, on payment of the usual fees, "if in his judgment, upon full hearing, the same should be granted." This proviso must be considered as, on the whole, formal and complimentary, as the acts pronounce the patents "hereby extended."

In some of the extension cases now before Congress, much interest is excited, as not only the interests of the public are affected, but extensive business arrangements have been completed by manufacturers, under the expectation that the patents were about to become, or remain, public property.

Another case of importance is that of Rollin White, of Massachusetts, for a rehearing, before the Commissioner, of his rejected application for an extension of his three patents, dated April 3, 1855, for improvements in repeating fire arms. The leading claim in these patents is for "extending the chambers of the rotating cylinder right through the rear for the purpose of enabling the chamber to be charged at the rear, either by hand or by a self acting charger. As early as 1866, Mr. White filed an application in the Office for an extension, which was refused by Commissioner Foote at the expiration of the term of the patent in 1869. It appears that the invention was not of any practical value until the invention of Smith and Wesson's metallic cartridge, and the patentee assigned his right, for a valuable consideration, to that firm. The validity of the patent was, about that time, contested in the courts by the manufacturing company of Allen & Co.; and in 1863, the case reached the Supreme Court, where four of the judges were in favor of confirming it, and four were against it. On the refusal of Mr. Foote to grant an extension, Mr. White immediately petitioned Congress for a rehearing before the Commissioner; and the bill of relief was passed by both Houses, without debate, on the last day of the session. On January 11, 1870, the bill was vetoed by President Grant, for reasons embodied in an accompanying communication from General A. B. Dyer, Chief of Ordnance, and approved by the Secretary of War. General Dyer says: "It is believed that the Government suffered inconvenience and embarrassment enough during the war, in consequence of the inability of manufacturers to use this patent, and that its further extension would operate prejudicially to the interest of the Government by compelling it to pay, to parties already well paid, a large royalty for altering its revolvers to use metallic cartridges." In the Senate, the bill was passed over the veto by a vote of 11 to 13. In the House, it caused one of the most lively debates of the session, Mr. Butler and Mr. Farnsworth engaging in a spirited tilt growing out of a charge of the latter that Mr. Butler had accepted a fee of $2,000 to advocate the interests of the patentee. The bill failed by an overwhelming majority—yeas, 12, nays, 168.

### A New Dodge in Advertising.

One of the most ingenious means of advertising we have met with is the following: A thin buff envelope, printed and directed as though it covered a telegraphic despatch, contains a slip which looks like a printed telegraphic dispatch. We read thereon that a certain tea company has the celebrated —— tea, pure and delicious, for sale in pound packages, etc., etc. Of course, being pleased at the trick, it is preserved and shown to one's friends, and so one circular is seen by many, as intended by the advertiser, who laugh over it, and pronounce it a clever trick, as was also anticipated. The genius who devised this dodge can go up to the head of the class.

ERRATUM.—In a small part of our edition of last week, the address of Mr. N. W. Simons, inventor of the patent safety hold back for carriages, is printed Williamsport, Ohio. It should be Williamsfield, Ohio.

DR. KANE, the arctic explorer, recorded the fact that snow at a temperature of 40 degrees below zero, F., loses much of its anti-frictional quality. He found it nearly as difficult to draw sleds upon such snow as upon sand.

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# Practical Hints to Inventors.

MUNN & CO., Publishers of the SCIENTIFIC AMERICAN have devoted the past twenty-five years to the procuring of Letters Patent in this and foreign countries. More than 50,000 inventors have availed themselves of their services in procuring patents, and many millions of dollars have accrued to the patentees, whose specifications and claims they have prepared. No discrimination against foreigners; subjects of all countries obtain patents on the same terms as citizens.

### How Can I Obtain a Patent?

is the closing inquiry in nearly every letter, describing some invention which comes to this office. A *positive* answer can only be had by presenting a complete application for a patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them: they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.

### How Can I Best Secure My Invention?

This is an inquiry which one inventor naturally asks another, who has had some experience in obtaining patents. His answer generally is as follows and correct:

Construct a neat model, not over a foot in any dimension—smaller if possible—and send by express, prepaid, addressed to MUNN & Co., 37 Park Row New York, together with a description of its operation and merits. On receipt thereof, they will examine the invention carefully, and advise you as to its patentability, free of charge. Or, if you have not time, or the means at hand, to construct a model, make as good a pen and ink sketch of the improvement as possible, and send by mail. An answer as to the prospect of a patent will be received, usually, by return of mail. It is sometimes best to have a search made at the Patent Office; such a measure often saves the cost of an application or a patent.

### Preliminary Examination.

In order to have such search, make out a written description of the invention, in your own words, and a pencil, or pen and ink, sketch. Send these with the fee of $5, by mail, addressed to MUNN & Co., 37 Park Row, and in due time you will receive an acknowledgment thereof, followed by a written report in regard to the patentability of your improvement. This special search is made with great care, among the models and patents at Washington, to ascertain whether the improvement presented is patentable.

### Caveats.

Persons desiring to file a caveat can have the papers prepared in the shortest time, by sending a sketch and description of the invention. The Government fee for a caveat is $10. A pamphlet of advice regarding applications for patents and caveats is furnished gratis, on application by mail. Address MUNN & Co., 37 Park Row, New York.

### To Make an Application for a Patent.

The applicant for a patent should furnish a model of his invention, if susceptible of one, although sometimes it may be dispensed with; or, if the invention be a chemical production, he must furnish samples of the ingredients of which his composition consists. These should be securely packed, the inventor's name marked on them, and sent by express, prepaid. Small models, from a distance, can often be sent cheaper by mail. The safest way to remit money is by a draft, or postal order, on New York, payable to the order of MUNN & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents.

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A patentee may, at his option, have in his reissue a separate patent for each distinct part of the invention comprehended in his original application by paying the required fee in each case, and complying with the other requirements of the law, as in original applications. Address MUNN & Co. 37 Park Row, for full particulars.

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## Notes & Queries.

*[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.]*

1.—CASTOR BEAN POMACE.—What is its value as a fertilizer, what should it be mixed with, and how much should be used per acre?—H. S.

2.—TRUEING GRINDSTONES.—Will some of your correspondents inform me how grindstones can be kept true by the means of a gas pipe?—A. J. P. S.

3.—COPAL VARNISH.—I would like to have a recipe for making a first quality copal or coach varnish.—L. G.

4.—SOLDERING STEAM PIPES.—Will some one please inform me of the best means of stopping cracks or leaks in steam or water pipes? Is there any way of soldering them?—E. W. K.

5.—ELECTROMAGNET.—What is the best way to make an electromagnet? Should the wire on the spools be in contact with the iron, or should it be insulated?—F. L. T.

6.—TEMPERING SPRINGS.—What is the best method of tempering cast steel springs, such as trap springs, gun main springs, etc.?—W. H. R.

7.—WELDING CAST STEEL.—Can any of your correspondents inform me of any method of welding steel castings, such as pitmans?—W. H. L.

8.—CEMENT FOR BRASS AND RUBBER.—Will any of your correspondents inform me of an insoluble cement which will hold together finished brass and rubber, or cork?—J. L.

9.—HEATING WITH STEAM.—Will some one tell me the proper size of a boiler which will heat, with steam, a house two stories high, with twelve rooms, containing say 50,000 cubic feet? The boiler is to be placed in the basement.—E. D. M.

10.—PERMANENT PENCIL MARKS.—Is there a kind of paper or cloth so prepared that, when pressed on a sheet of paper which is written on with a common lead pencil, it will cause the pencil marks to become permanent and ineffaceable.—A. F. S.

11.—DISLODGING SOOT.—There is wanted very much, out here in Iowa where we burn so much soft coal, some preparation which burned in the stove or in the flue or pipe, or vaporized therein, will cause the coal soot to become dislodged from pipe and flue, and fall down?—A. F. S.

12.—CLEANING GUTTA PERCHA.—Can any one tell me how to keep the gutta percha covering, on the telegraph magnet, nice and shining?—O.

13.—PAPER FRICTION PULLEYS.—I would like to learn, through the SCIENTIFIC AMERICAN, how paper friction pulleys are made, and whether they are better than wood or leather to drive iron pulleys?—L. I. O.

14.—GALVANISM IN WINE MANUFACTURE.—Will "Amateur," of Paris, France, tell me definitely the mode of application in this process? Are the silver plates to be in contact in the juice, and if not, how far apart? The right dimensions of the plates and battery will also be valued by me.—J. S.

15.—Mr. W. H. Dabney, of Teneriffe, U. S. Consul for the Canary Islands, writes to ask whether any of our readers can give him information about a machine for separating the fibers of agave, sisal and New Holland hemps, as well as those of analagous plants; and also by whom such a machine is manufactured.

16.—BROWNING GUN BARRELS.—Will some correspondent give me a little information on this point? I use the following prescription for browning iron, gun barrels, etc.: Tincture of muriate of iron, 1 ounce nitric ether, 1 ounce, sulphate of copper, 4 scruples, rain water, 1 pint. Now what I wish to know is, how long ought the barrel to remain after the application of the liquid. How can I best stop the action of the acid? And what's the best mode of finishing the article thus treated? I have seen work, finished with this preparation, with a fine glossy appearance; how is it produced?—W. H. R.

17.—SHRINKING OF WOOLENS.—Can any one give us through the columns of your interesting paper, the philosophy of the shrinking of woolens by successive washing? I know finely made and substantial woolen shirts become too small to wear, long before they were worn out. Perhaps it was the fault of the washwoman, perhaps not. Is there a way of washing them that will not shrink them?—F. X. M.

18.—STEADYING THE MOTION OF GANG SAWS.—I have a large gang mill in Pennsylvania, with forty saws hung in one gate, driven by a large steam engine. I have had a great deal of trouble in trying to get it to run steadily, and have not yet succeeded. It is a very heavy gate, weighing nearly 5,500 pounds, and is hung upon the wrist. Now, can I find a point

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on which to put a counter balance, to round up the motion to make it run as steadily as if it were not a crank motion? I am going to make a thorough test, by putting on counter balance to overcome the weight of the gate. What is your theory as to putting on balance opposite to the wrist, or must a fly wheel be put on of sufficient weight that the momentum will carry it past the dead centers so as to steady the motion and resistance of the cut of the saws?—E. F. J.

19.—THE SEA WAVES.—Can any one oblige me by answering the following questions? What is the average hight of the waves of the ocean, in a heavy sea, and also in an ordinary sea? What is the distance from the center of one wave to the other? What is the difference in the hight of the ends of an ordinary ocean steamer when the stern is in the trough of the sea and the bow on top of the wave in a heavy sea, and also the same in an ordinary sea?—J. G. H.

20.—PLUMBERS' SOLDER.—Will some one please tell me how much time is necessary to thoroughly eat all the impure metals out of plumbers' solder, and the quantity of water to put to the sulphuric acid? My object is to get the metal to retain its heat while in a semi-melted state (while wiping with the cloth) as quickly and at the least expense possible. Such metals as zinc, iron, and bismuth give it a tendency to crystallize and to be porous and white instead of having a bright solid metallic shine when the joint is wiped. We plumbers have always used sulphur with a little rain thrown into the pot while the metal is at a dull red heat, but that not only burns the zinc out, but also the tin, lead, and pot together.—W. S.

21.—PURITY OF WATER.—In the SCIENTIFIC AMERICAN for Feb. 17th is reprinted an article by Professor Chas. F. Chandler on the "Effect of Animal Excreta in Water." As the majority of our population residing out of large cities is dependent on wells for its water supply, this is a matter of the greatest importance to thousands who, nevertheless, are not aware of its importance. The points of the above article were included in a lecture, delivered by Professor Chandler about a year since, before the American Institute. At that time, he stated that there had not then been discovered any chemical test for discovering the presence of sewage contamination in water, nor was it apparent to the senses, except by its influence on health. Has any method since been discovered for its easy detection? In villages and country towns especially, privies, cesspools and drains are unavoidably located unpleasantly near the wells, and this is used as a strong argument by those interested in the sale of earth closets. Comparatively few use earth closets at all, and of this number still less apply the system so thoroughly, to all sources of contamination, as to secure the advantages claimed therefor. Can Professor Chandler, or any one, point out a feasible method of securing immunity (as society is at present constituted) from sewage poison? What amount of filtration through the different soils is necessary to secure perfectly pure water? Or in other words, as a privy or cesspool and a well must often exist within the limited enclosure of a village lot, what would be the nearest approach that would be admissible, while securing freedom from contamination?—J. Q.

## Answers to Correspondents.

*SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at $1 00 a line, under the head of "Business and Personal.*

*ALL reference to back numbers must be by volume and page.*

INDICATOR OF METALS.—W. H. L. is informed that there is no known substance that will attract gold, silver, or lead.

J. L. J., of R. I.—A. L. D., of Canada.—For the mechanical books you mention, Bourne's "Catechism of the Steam Engine," and Dussauce on "Perfumery," address H. C. Baird, Philadelphia.

CEMENT FOR ALABASTER.—In answer to query No. 7, page 90, Vol. XXVI., I would say that I have had success in cementing different kinds of stone together, and also stone to wood. I use plaster of Paris tempered with glue, mixed up in small quantities as needed. It takes some time to set.—E. B. M.

COPPER DIP FOR IRON CASTINGS.—Query 2, February 10, 1872. Dissolve two pounds sulphate of copper in three gallons of water, and add two fluid ounces sulphuric acid.—K., of Conn.

RUBBER BOOTS.—J. R. M. can patch his rubber boots as follows: Rub the patch and boot thoroughly with sharp sand paper. Smear both with liquid rubber five times, every time letting them dry. Do this once more, and, before they dry, apply the patch, with pressure, if possible, and the boot is mended. If liquid rubber is not obtainable, dissolve small pieces of rubber, not vulcanized, in warm spirits of turpentine to the consistence of molasses in summer.—L. S., of N. Y.

WATERPROOFING BOOTS.—In answer to query 2, page 42 of current volume, I will say: Let C. B. take one pint neatsfoot oil, one pound old rubber boots, and one ounce rosin. Melt slowly, take out the fragments of the cloth of the old boots, and apply warm, say at 100° Fah. The boots will be water and snow proof.—C. E. G.

TENSILE STRENGTH OF SWEDISH IRON.—O. W. is in error in quoting our statement, as to the above, as from 120,000 pounds to 160,000 pounds. Our figures (see page 107) are from 70,000 pounds to 112,000. Knut Styffe bears us out in this statement. On pp. 124 and 125 of the English edition of his work, he gives the breaking weight of puddled steel and puddled iron from Surahammer as ranging from 72,737 pounds to 111,987 pounds, and the average of all the results in this table is about 85,000.

HYDRAULIC CEMENT.—J. A. T., on page 106, can take lime which contains from twenty to thirty per cent of clay or finely divided silica and make it into mortar with water. Should he wish to make watertight joints for a slate cistern, or aquarium, or for filling up metallic joints, let him take equal parts of red and white lead and work them to a thick paste with boiled linseed oil. This hardens slowly.—R. T., of Ill.

VOLUME OF HYDROGEN.—W. W., page 90, current volume, will find 22,429 97-107 cubic inches in one ounce of hydrogen, being ·0214 of a grain to one cubic inch.—R. T., of Ill.

SLIDE VALVE QUESTIONS.—Query 17, page 90, current vol. I more than agree with C. G. concerning the engine he has been repairing. I think there must have been some heavy rotary motion, either in the shape of fly wheel or mill stone, to carry the engine over the centers. I claim that any amount of lead that forces back against the crank before it gets to the center is a resistance; all the lead that is required is to overcome the *inertia* of the reciprocating parts, and this is partially accomplished by the lap of the valve cutting off the exhaust. I think that one thirty-second of an inch would be lead enough on the feed side, and about one sixteenth on the exhaust side. The more exhaust lead and lap of the valve there is, the less feed lead is required.—E. W. K.

POUNDING OF PISTON.—Query 12, page 90, current volume. To W. M. T. I think the pounding in your engine arises from the connection of the piston rod and the cross head; if this is the case, there will be some difference in sound; for, as the engine starts on the front stroke, it forces the piston rod into the beveled socket in the cross head; whereas when it commences its return stroke, it withdraws from the socket against the key. A very little play in this joint will make a good deal of noise.—E. W. K.

D. S., of Pa.—The insurance companies have good reason to charge higher rates for woolen mills heated by steam pipes, in which buildings woolen waste, wood, and other rubbish about the mill are allowed to come in contact with the pipes. Woolen waste often takes fire spontaneously when oily, and so will wood shavings. The danger of this is much increased by artificial heat, even though the latter is not intense enough to ignite these substances directly.

W. C. A., of Mass.—The reason that low steam will not dry yarn as readily as high steam is that the yarn holds its moisture by adhesive attraction with such force as to require greater heat than the ordinary boiling point to expel it. The conditions for the evaporation of water under any circumstances are very different from those of heating a gas or mixture of gases. The force of the vapor of water at 212° is just that of the atmospheric pressure, and thus only surface evaporation from moist yarn could take place at this temperature. With higher temperatures, the water is converted into steam exceeding in expansive force the pressure of the air, and is thus expelled with greater or less rapidity.

LIGHT ENGINES FOR SAW MILLS.—In the SCIENTIFIC AMERICAN of January 20, query 16, inquiry is made how can an engine of light power be made to run a saw and cut lumber in proportion to the power used. This is a subject which should be better understood than it is by many. There is no reason why a ten horse power should not be made to cut one half as much as a twenty, or a five horse power to cut one fourth as much. The common mistake made when engines of limited power are used is to run the saw with too high a motion. If a twenty horse engine can revolve a forty inch saw successfully at 300, a ten horse power should revolve the same saw at 150 revolutions in the same time, and a six horse power should revolve the same saw at 90. The difference in the power of the engines must be made in the revolutions of the saw, and not in the feed. Or, in other words, the cut of the saw for each revolution should be the same with the ten as with the twenty horse power engine. A fifty inch saw, run by the same power as a forty inch, should revolve one fourth slower, but should be made to cut one fourth more to each revolution. Perhaps some will ask why the ten horse power may not run the saw with same number of revolutions as the twenty, making the difference in feed. But in this case it would have the same friction to overcome as the twenty, and consequently but a small part of its effective power would remain. One of the first things to do in applying a small power engine to run a saw mill is to enlarge the saw pulley. With an eight or ten horse power portable engine of the usual order, the saw pulley should be made nearly or quite the size of the saw. If the saw is forty inches diameter, the pulley should be made nearly the same.—S. W., of Ga.

G. L., of Vt.—In the long run you will find it better to carry the water to drive your proposed factory through a canal sixty rods than to attempt to transmit the power through that distance by compressed air and the aid of an engine. The expense of pipe and engine will nearly or quite construct the canal, unless very adverse circumstances in cutting the latter exist; and a canal will cost little or nothing for repairs.

POUNDING OF PISTON.—Query 12, February 3, 1872. To W. M. T. Your engine may be out of line, so that tightening any of the bearings may be only temporary relief. Engines that have run some years, working full capacity, frequently pound when passing centers from the shaft wearing flat in the crank bearing on the side next the crank pin, as this portion of the shaft takes the heaviest strain on either center. There is no remedy except to true up the shaft in a lathe, and refill the box. Watch the main bearing carefully, when the engine is running with a heavy load on, and see if the lost motion is not in the main box.—C. T. S.

E. S. E., of N. J.—I contend that it is impossible for a player of ball, in throwing or pitching the ball, by any particular "twist" or "screw" of the wrist, or by any possible device, to cause the ball to describe a curve in the air, that is, to turn to the right or left in the track of a curve after leaving his hand. Of course the parabolic curve which it makes in its fall to the earth is not referred to. I maintain that any regular body, such as a sphere or cube, hurled by the hand cannot be, unless blown by wind, made to go in any line except one in a straight vertical plane, and that the famous slow and deceptive pitchers in base ball have never yet succeeded in making a ball deflect to the right or left, in the form of a curve. The boomerang I suppose is irregular in form, and its motion, like all deviations of a flying body, is produced really by a compound force. Please settle this point, as there is a wide diversity of opinion about it among men who set themselves up as authorities.—E. S. E. Answer: You are right in every particular.

D. W. H., of Mo.—The friction of the earth upon the ordinary plow is greater upon the mold board than upon the land side and bottom together. Therefore, one half of the power used in drawing a plow is not wasted by friction on the land side and bottom.

R. G., of Nova Scotia.—We advise you to use steam pipes for your lumber drying room.

FACING OIL STONES.—The most convenient way to face oil stone that I have yet tried is to use No. 3 sand paper. I have used it for about six years, and have always found it effectual; and it is generally so convenient that it can be done at short intervals, and the stone at all times kept in a good condition. I lay the sand paper upon a smooth and true surface, and in rubbing I confine myself to one half of the sheet until it is nearly rubbed down, to leave a sharp surface to finish up with. One sheet of sand paper has always answered for me, and it can be done in from ten to twenty minutes.—H. W., of Ill.

## Recent American and Foreign Patents.

*Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.*

CAR COUPLING.—John A. J. Chapman, Kansas city, Mo.—When two cars are uncoupled a dart headed link is held by one or the other, the free end of said link being held by springs in such a position as to freely enter the jaws of the opposite draw head. The spring, adjusted in strength and position for the purpose, presses against the inclosed dart head beneath it, and thus sustains the outer or free end of the link. The invention consists in an arrangement, of the springs described, with the pivot jaws and a combination with a car coupling, of bars, a compression spring, ratchet, and pinion, by which the proper movements and the desired attachment are made.

UPRIGHT PIANO FRAME.—Justin Whitney, Boston, Mass.—The frame stands upright, and forms the back, which supports the strings of the instrument, the strings being drawn across it over the bridge and sounding board. The sides and bottom of the frame are made in double angle form, and the trusses are of iron in the form of double Ts in cross section. The top is of irregular form, the front portion being the bridge over which the strings pass. Like some other parts of pianos—the legs, for instance, for square or horizontal pianos—these frames are made for the "trade" and sold as an article of commerce, the form or size of the frames being varied to suit different piano manufacturers.

PROPELLING BOATS.—Charles Dancker, Hoboken, N. J.—In the stern portion of a canal boat is hung a transverse crank shaft, to which oscillating motion is imparted by means of steam or other power. The cranks of the shaft are connected to the front ends of rods that extend backward through the stern of the boat, where they are packed water tight. The motions of the rock shaft serve to move the rods back and forth. To the outer end of each rod, behind the stern of the vessel, is pivoted a metallic or wooden blade, of suitable width and length the pivot pin being rigidly attached to the rod. To said pin is also secured a metal or wooden plate, which has its ends guided in grooves or tracks provided in backwardly projecting frames of the boat. The said frames also hold transverse pins or friction rollers, upon which the propeller blades rest. As the rods move outwardly they push the blades back, and cause them to gradually drop from a horizontal into a vertical position by bringing its pivot gradually nearer to the supporting pin. The blade crowds the more against the water the more it is brought into a vertical position, the covering plate to which it is attached preventing the water from escaping over the top. In moving forward, the rod draws the blade gradually into a horizontal position, and prevents it from hindering an advance of the boat. The rudder is hung in cross pieces that connect with the projecting frame. One or more rods, blades and plates may be applied to one boat. The space inclosed by the frames may be closed on top if desired. A modification of the invention is one in which the blade is drawn into a pocket formed in the stern of the boat, the projecting frames being dispensed with. In this case two rudders are preferably used near the sides of the boat.

CLOTH PLAITING MACHINE.—Joseph A. Sawyer, Worcester, Mass.—This very ingenious invention relates to a new machine for plaiting fabrics to be used in the manufacture of shirt bosoms, and for other purposes. The invention consists in the use of several appliances for imparting and regulating the necessary motion and guiding the fabric. Seven distinct claims have been allowed on this invention which shirt manufacturers would do well to examine, as we regard it as one of much importance to this line of business.

WASHING MACHINE.—Henry S. See, Evansburg, Pa.—The clothes to be washed are placed upon the bed, and a reciprocating motion is given to a rubbing frame, which carries a rubber over the clothes. The rubbing frame acts as a lever, the rubber being the fulcrum. A reciprocating frame, in combination with spindles, rollers, standards, springs and pins, is employed in combination also with a board pivoted to side pieces and arranged with the bed.

WALL GUARDS FOR FURNITURE.—James L. Brander, Boston, Mass.—The object of this invention is to provide a cheap, safe, and convenient means for preventing the defacement of the walls of parlors and other apartments by the backs of sofas, lounges, or other similar articles of furniture. It consists in a guard, of crescent shape, screwed to the floor so that the front or concave side shall receive the leg of the sofa, lounge, or other article, and so that the guard shall act as a stop to prevent the back of the article from touching the wall of the room.

WASHING MACHINE.—Martin Way and Frank Way, of Springfield, Ohio.—This invention relates to a new washing machine of extremely simple construction. A frame supports the wash tub, which has a cover, the cover having a hinged lid over a central aperture. Vertical posts are attached to and under the cover, extending not quite to the bottom. A crank shaft, swivelled in the lid, carries a forked frame. By operating the crank, the frame rubs the clothes against the posts and thereby cleanses them from dirt.

TIME LOCK FOR BURGLAR PROOF SAFES.—John Burge, of Circleville, Ohio.—This lock is placed upon the inside doors of vaults or safes, and moved and operated by clock work, so that no key hole or other aperture through the door is necessary. A mechanism composed of a revolving cam wheel and actuating plate and springs is employed, by means of which a continuous motion in one direction locks and unlocks the door. The inventor does not confine himself to any peculiar clockwork or mechanism for this purpose, but designs to use any motive power within the safe or vault by which the purpose may be effected. Neither does he limit or confine himself to the precise form or arrangement of any of the parts described, as they may be varied in many ways without departing from the invention.

BEER FORCING APPARATUS.—William H. Otto and Peter Korper, of Tremont, Pa.—This invention has for its object to furnish an improved apparatus for forcing beer out of the keg. It consists in the construction and combination of an apparatus by which, on opening a stop cock and the faucet of the beer keg, the beer will be forced out violently from the keg. The beer keg may be placed at any desired distance from the operating parts of the apparatus, which may be placed beneath the bar, or in any other convenient place.

BIN FOR STORING AND DRYING GRAIN.—Jarvis Royal, of White Rock, Ill.—This invention is an improvement in the construction of bins, boxes, ships, boats, etc., in which grain or other substances are placed for storage or transportation, so that the substances placed in them—whether grain, fruits, flesh or fish, salt or sugar—may be dried and thus preserved from injury from dampness; and it consists in lining the inside of the bins with porous bricks or tiles. The bricks or tiles may be secured in place by a slight frame work, or in any other convenient manner. In case plain brick or tile are used to line the bin when made close, thin laths should be placed along the sides and bottom of the bin for the bricks or tiles to rest against, so as to form channels or openings for the ingress of the air. In some cases—as, for instance, in grain boats and ships—it may be advisable to line the lower part of the bin with thicker and heavier brick or tile than is necessary for the sides or upper parts. By this construction the porous bricks or tiles will, it is claimed, absorb the water from the grain or other substance, which, coming in contact with the air in the chamber or corrugations, is evaporated. This process of absorption and evaporation continues until all the grain in the bin is sufficiently dried. The claim is based upon the interposition of these laths so as to form the open spaces between the bricks or tiles and the outer walls of the bin.

CARRIAGE WHEELS.—Charles H. Appel, of Allentown, Pa.—This invention pertains to an improvement in the devices for securing the spokes of carriage wheels in the sockets of their wooden hubs; the invention consists of a detachable metallic ring or collar, provided with dovetailed lugs, in combination with the spokes and wooden hub.

FISHING APPARATUS.—Orange M. Fuller, of Catasauqua, Pa.—This invention consists of a float from which the line is suspended by a trip lever and spring in such a manner that when a fish takes hold of the hook and pulls on the line, the spring will be tripped by the lever and the fish will be hooked; also a weighted arm, held in a horizontal position by the spring, will be let fall to raise a flag as a signal that a fish is taken, and the hook will be pulled in by the spring, so as to fasten the fish, the said float being connected by a long line to a reel in the hands of the operator, to be pulled in by him to secure the fish.

ORE AND STONE CRUSHER.—Robert Learmouth, of Buffalo, N. Y.—A method of adjusting the stationary jaw, by means of detachable links formed of different lengths, constitutes this invention. In other respects the construction does not differ from other stone crushers in use.

VISE.—John Peace, of Camden, N. J.—The vise is placed on horizontal and vertical swivels, so it can be turned in suitable direction to hold the work in convenient position. The invention consists in a new general arrangement of parts, and also in a new application of the proper jaws. A flanged and flat sided screw, provided on opposite sides with jaws, when combined with and swiveled to a nut, constitute the claim on which a patent has been obtained.

CASTERS FOR FURNITURE.—William Ireland Blackman, of Columbus, Miss.—This invention relates to an improvement in casters for furniture. It consists in the mode of confining the ball and securing the caster to the leg. A shell in which the ball is confined, having a shank, a fastening ring, a thimble, and a holding pin are the several parts of the device. The shell and shank are made in two pieces, forming a globular opening for the ball and a tapering shank for the leg. The main bearing or the ball is at the center of the globular opening above; but, to reduce the frictional surface of the shell, there is a small rib with which the center of the ball comes in contact. About one fourth of the diameter of the ball projects below the shell. The bottom of the thimble rests upon a shoulder and a collar of the thimble rests upon the top of the fastening ring, while the ring itself rests upon the shoulder. The fastening ring is secured to the end of the leg. The ends (one or both) of the holding pin project from the shank over the edge of the thimble, which prevents the caster dropping from the leg when the piece of furniture is raised. In some cases the entire shell and shank will be let into the leg, in which case a larger ring will be used.

STONE LIFTER AND STUMP EXTRACTOR.—Josiah Knoop, Casstown, O.—The invention consists in several improvements, upon the portable stone lifters and stump extractors heretofore known to the public, by which the inventor has produced a durable and convenient machine, peculiarly well adapted to its purpose. It seems to provide pretty effectively for all the accidents to which such machines are liable, and to economize the power required in producing the desired effect.

CULTIVATING PLOW.—Cealy Billups, Norfolk, Va.—The invention consists in constructing two wing mold boards so that they can be reversed on the cultivator plow and thus made to represent two different sizes and widths. The same wings will thus serve for all stages in the growth of the plant and never require to be left off the plow.

FENCE.—Alfred M. Aplin, Chetopah, Kan.—The invention consists in forming a fence of tubular clay posts placed close together in the ground and held in line by top caps at suitable intervals. This fence dispenses entirely with rails, is almost imperishable, and yet may be made at the small cost of about 30 cents a panel.

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ANIMAL TRAP.—Lawrence Lewis, of Tuskegee, Ala.—This invention has for its object to furnish an improved trap for catching rats, mice, and other animals. The animal, in trying to reach the bait, steps upon a platform, which withdraws a catch from the door of a box and allows the door to be revolved, through a quarter of a revolution, into a vertical position, when its upper edge is caught and held by another catch. The slam of the door frightens the animal, which, seeking to escape, rushes through the passage way leading into a rear compartment, raising another door in his passage, which movement operates a lever, releases the first door, and allows it to be revolved into a horizontal position, again setting the trap.

HAY LOADER.—Thomas Giffin, of Perrysville, Ohio.—This invention has for its object to furnish an improved machine for loading hay spread upon the ground directly upon the wagon. It consists in the construction and arrangement of bearings and castings arranged upon an axle and the frame work of the machine, with a combination of rake teeth and guides with a frame work and a carrier.

HARVESTER.—Ernst Henry Ruwe, of Walcott, Iowa.—A revolving rake or scraper, having mechanism to carry it over a double track is employed in this invention. The platform is projected beyond the divider and is turned upon a curve corresponding to the orbit described by the passing scraper. By this construction not only is an auxiliary divider furnished which will press the standing grain out of the way of the revolving rake, but an extension which effectually prevents, by its acclivity, the straw from working over the edge of the platform. A rod placed longitudinally across the platform and directly in the rear of the cutter bar, holds up the butts of the straw and prevents the scraper from passing over them. A cross bar, with its fingers and a double rail, causes the endless chains to move uniformly and without wabbling.

[OFFICIAL.]

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| Cartridge box, J. W. Frazier | 123,883, 123,884 |
| Caster, pickle, H. C. Wilcox | 123,961 |
| Chair, folding, C. Marcher | 123,832 |
| Chill for casting chilled rolls, R. Tolmie | 123,953 |
| Chimney, steamboat, C. and R. Hawthorn | 123,896 |
| Chimney, steamboat, W. J. Hamilton | 123,825 |
| Cloth, method of drying napped, W. Chapin | 123,768 |
| Cock, valve, S. Adams (reissue) | 4,762 |
| Coffin from paper or other pulp, F. Keenan | 123,781 |
| Corn shellers, A. Adams | 123,758 |
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| Cultivator, seeder, and stalk cutter, combined, J. and W. Whait | 123,959 |
| Curtain fixture, E. T. Briggs | 123,861 |
| Cutter head, A. Van Vleck | 123,800 |
| Desk, school, W. A. Slaymaker | 123,796, 123,797 |
| Digger, potato, Wing and Green | 123,966 |
| Digger, potato, W. W. Speer | 123,846 |
| Diseases in vacuo, treating, R. S. Gee | 123,887 |
| Drawing frames, stop motion for, D. W. Hayden | 123,826 |
| Dredge box, W. S. Potwin | 123,792 |
| Drilling machine, W. and J. Gardam | 123,886 |
| Earth closet, A. A. Jaqua | 123,780 |
| Electromagnetic annunciator, C. E. Chinnock | 123,808 |
| Elevator, C. W. Baldwin | 123,761 |
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| Engines, valve for direct acting, G. F. Blake | 123,764, 123,765 |
| Fastener, door or shutter, W. Fields | 123,816 |
| Faucet, bush for, Netzow and Heck | 123,789 |
| Fence, A. M. Alpin | 123,854 |
| Fence, flood, R. S. Gilcrest | 123,839 |
| Files, machine for cutting, A. Weed | 123,849 |
| Fire arms, projectile for, S. E. Jones | 123,828 |
| Fire extinguisher, C. L. Levey | 123,783 |
| Fire extinguisher for steam boilers, A. G. Davids | 123,874 |
| Fruit box, J. Shepard | 123,941 |
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| Furnace, steam boiler, C. H. Fox | 123,882 |
| Furnace for smelting iron, S. W. Harris | 123,894 |
| Furniture, fender for, G. R. Wilmot | 123,965 |
| Gas from petroleum, manufacture of, W. H. Spencer | 123,950 |
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| Gate, children's nursery, E. Howard | 123,904 |
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| Paper, figure tinted, La Monte and Saxe | 123,782 |
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| Saw grinding machine, C. T. Shoemaker | 123,945 |
| Saw mills, head block for, D. Lane, (reissue) | 4,764 |
| Screw cutting machine, L. W. Stockwell | 123,951 |
| Scythe blades, manufacture of, N. P. H. Willis | 123,964 |
| Seats and desks, joint for, J. Peard | 123,928 |
| Sewing machine, T. Hall | 123,892 |
| Sewing machine, Q. M. Youngs | 123,852 |
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| Sewing machines, ruffling attachment for, A. Johnston | 123,910 |
| Sewing machines, ruffling attachment for, H. Moschcowitz | 123,788 |
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| Shutter, rolling, Von Langen and Robb | 123,802 |
| Sign, J. H. and C. W. Crane | 123,871 |
| Soldering gas cock for, Walker and Jones | 123,956 |
| Spinning machines, spindle and whorl for, W. T. Carroll | 123,867 |
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| Steam gage, registering, E. H. Ashcroft | 123,855 |
| Stone litter and stump extractor, J. Knoop | 123,916 |
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| Supporter, uterine, L. A. Babcock | 123,856 |
| Table, folding, A. C. Ballard | 123,806 |
| Table, sofa, and bed, combined, D. Katzenstein | 123,829 |
| Tables, drop leaf attachment for sewing machine, E. F. French | 123,818 |
| Telegraph insulator, D. R. P. Emminger | 123,878 |
| Telegraph, signal box for fire, Wright, Holley and Miles, (reissue) | 4,970 |
| Thill coupling, W. G. Foster | 123,881 |
| Thill coupling, D. A. Johnson | 123,909 |
| Tobacco, treating, J. Ashcroft | 123,760 |
| Tooth pick machine, Noble and Cooley | 123,790 |
| Top joint, etc., C. W. Saladee | 123,936 |
| Trap, animal, J. M. Hill | 123,779 |
| Trap, fly, D. Henderson | 123,897 |
| Trap, gopher, J. Bowman | 123,807 |
| Trolling hook, G. Sinclair | 123,844 |
| Truck, brick machine, F. L. Hall | 123,777 |
| Umbrellas, device for opening or closing, E. P. Jones | 123,912 |
| Valve, globe, E. Thayer | 123,843 |
| Valve, self-acting water, J. N. Deck | 123,771 |
| Ventilator, car, W. G. Creamer | 123,770 |
| Vise, Crawley and Baylies | 123,872 |
| Washing machine, J. C. Hallenbeck | 123,893 |
| Washing machine, P. B. Bristol | 123,862 |
| Watch case spring, C. Tribby | 123,798 |
| Water wheel, J. Tort, (reissue) | 4,766 |
| Weeding machine, A. H. Sherwood | 123,944 |
| Wells, formation of drive, E. S. Hovey | 123,903 |
| Whip socket, L. C. Clark | 123,769 |
| Wood, etc., composition for preserving, G. A. and P. C. Vivien | 123,801 |
| Wringer, clothes, E. P. Russell | 123,794 |
| Yarn, machine for drying, R. Hartman | 123,895 |

## DESIGNS PATENTED.

5,543.—CUTLERY BOLSTER.—M. Chapman, Greenfield, Mass.
5,544.—CHAIN LINK.—V. Draper, North Attleborough, Mass.
5,545.—CHAIN BAR.—V. Draper, North Attleborough, Mass.
5,546.—OIL CLOTH.—J. Hutchison, Newark, N. J.
5,547.—PARLOR STOVE.—J. Martino and J. Currie, Philadelphia, Pa.
5,548.—BORDER.—J. Moore, Brooklyn, N. Y.
5,549 to 5,552.—CARPETS.—W. McCallum, Yonkers, N. Y.
5,553.—SODA FOUNTAIN.—G. F. Meacham, Newton, Mass.
5,554 and 5,555.—CARPETS.—D. Paton, New York city.
5,556.—CROQUET IMPLEMENT.—J. W. Pettengill, Rockford, Ill.

## TRADE MARKS REGISTERED.

658.—GIN.—Adams & Taylor, Boston, Mass.
659.—WHISKEY.—Adams & Taylor, Boston, Mass.
660 and 661.—KNITTING COTTONS.—J. Attwell, Jr., New York city.
662.—WELTING CORD.—J. Atwell, Jr., New York city.
663.—CALICO PRINTS.—Coffin & Altemus, Philadelphia, Pa.
664.—REFRIGERATORS AND WATER COOLERS.—A. M. Lesley, New York city.
665.—CONCENTRATED AMMONIATE.—Navassa Phosphate Co., New York city.
666.—CUTLERY.—G. Wostenholm & Son, Sheffield, England.

## APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed and are now pending for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

20,227.—HARVESTER.—J. S. Troxel. April 24, 1872.
28,512.—CAR WHEEL.—S. P. Smith. May 1, 1872.
20,249.—HULLING CLOVER, ETC.—J. C. Birdsell. May 1, 1872.
20,306.—AFFIXING STAMPS TO LETTERS.—G. K. Snow. May 1, 1872.

## EXTENSIONS GRANTED.

19,384.—BANK CHECK CANCELER.—William M. Simpson.
19,377.—HARVESTER.—F. Nishwitz.
19,377.—HARVESTER.—F. Nishwitz.
19,433.—HARVESTER.—J. S. Butterfield.
19,347.—RUBBER MAT.—E. F. Chaffee.
19,346.—PROPELLING BOAT.—H. Camp.
19,398.—HYDRAULIC VALVE.—C. and G. M. Woodward.
19,370.—KNITTING MACHINE.—J. K. and E. E. Kilbourn.
19,349.—SHINGLE MACHINE.—G. Craine.

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### Inventions Patented in England by Americans.

From January 26 to February 8, 1872, inclusive.
[Compiled from the Commissioners of Patents' Journal.]

ALARUM FOR GRIST MILL.—T. Glasspool, Minneapolis, Minn.
BURNING HYDROCARBONS.—J. K. Caldwell, Philadelphia, Pa.
CARPETS, ETC.—W. Webster, Morrisania, N. Y., and C. M. Meserole, New York city.
COMBINING MINERALS AND VEGETABLES.—A. Hitchcock, New York city.
DETECTING LEAKAGE, ETC.—A. G. Myers, New York city.
ENGINE OPERATED BY EXPLOSION.—J. S. Foster, Salem, Mass.
FIRE ARM.—A. Burgess, Owego, N. Y.
FLUTING MACHINE, ETC.—T. M. Tucker, Newark, N. J.
GLOVES, ETC.—J. Harrison, Chicago, Ill.
IRON AND STEEL.—C. M. Nes, York, Pa.
KILN.—A. R. Morgan, New York city.
LAMP BURNER.—A. G. Myers, New York city.
METAL KNITTED FABRICS, ETC.—W. Edge, Newark, N. J.
NAIL MACHINE.—J. Lawrence, Philadelphia, Pa.
ORDNANCE.—D. Macomber, Utica, N. Y.
PACKING PAVEMENT, ETC.—B. B. Hotchkiss, New York city.
PAVEMENT.—B. B. Hotchkiss, New York city.
PEGGING MACHINE.—L. R. Blake, Fort Wayne, Ind.
PREPARING HOPS, ETC.—D. A. Clarke, Baltimore, Md.
SEWING LEATHER, ETC.—G. V. Sheffield, Providence, and G. K. Mello Woonsocket, R. I.

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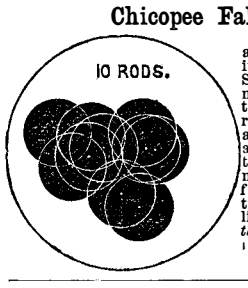


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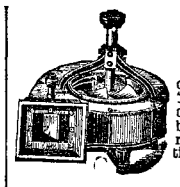

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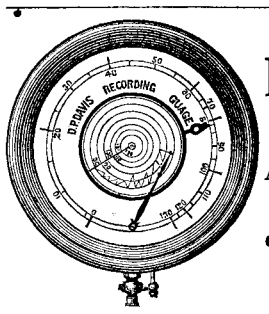


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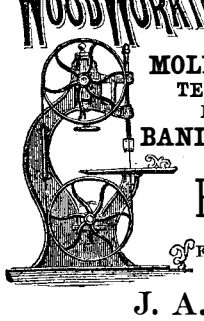

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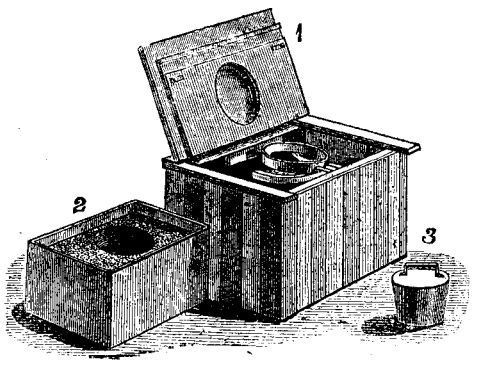


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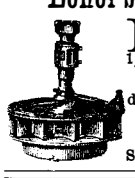

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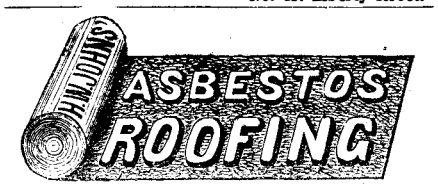


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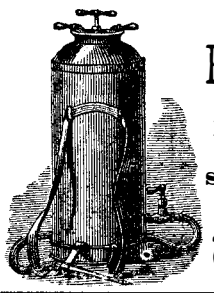

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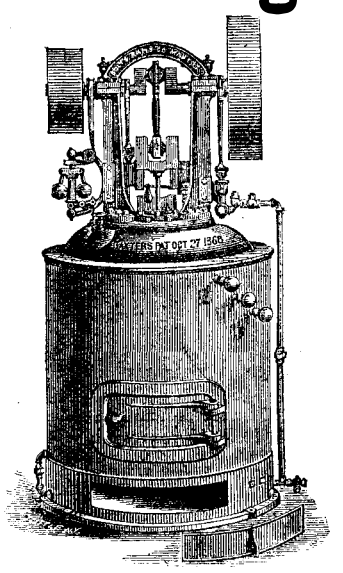

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